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Perceptions of Defendants with Traumatic Brain Injury in the Criminal Justice System

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MSc, BSc (Hons)

Abstract

Whilst traumatic brain injury (TBI) is overrepresented in the criminal justice system (CJS), little evidence has directly explored how people who have offended with a history of TBI are perceived by key legal decision makers in the UK legal system. This thesis aimed to investigate how individuals with TBI are perceived in the context of a UK magistrates' court, and how information about TBI is evaluated in sentencing recommendations. The first part of this thesis explored how misconceptions around the nature of, and recovery from, TBI are common amongst laypersons. However, the measures used to evaluate perceptions of brain injury lack thorough psychometric evaluation and are limited in scope. Consequently, two new tools, the Perception of Brain Injury Measure (PBIM36) and Brain Injury Awareness Scale (BIAS20), were developed and rigorously evaluated. Findings revealed that laypersons expect that recovery from the invisible effects of TBI to mirror those for physical recovery. These insights then informed the experimental work reported in the second half of the thesis, and fictional magistrates sentencing remarks were developed. In Experiment One, participants, drawn from the general population, rated the magistrates' verdict similarly across all TBI Presentation conditions, irrespective of whether a physical marker of injury was presented. Notably, similar ratings were given to a defendant presented with and without a history of TBI. Experiments Two and Three showed that including additional educational information to increase understanding of the hidden impacts of TBI led to lower sentencing recommendations. Furthermore, different types of educational materials (i.e., factual information and a personal story of TBI) had similar impacts upon sentencing recommendations. In conclusion, key legal decision-makers may need educating on the effects of TBI as otherwise, they may be unable to recognise and appropriately adjust for the ongoing impacts of a TBI on an individual's behaviour.

Declarations

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.......... [redacted] ....

Date....25.01.23...

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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Authorship Statement

The following people and institutions contributed to the publication of work undertaken as part of this thesis.

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EB: conceptualisation, literature review, project administration, writing - original draft, writing—review and editing. CW, RH, AW: conceptualisation, writing - review and editing, and supervision. All authors gave approval for submission, contributed significantly to the article, and are responsible for its contents.

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We the undersigned agree with the above stated “proportion of work undertaken” for each of the above published peer-reviewed manuscripts contributing to this thesis:

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List of Abbreviations

ANOVA	Analysis of Variance
BIAS	Brain Injury Awareness Scale
BIMS	Brain Injury Misconception Scale
BISAS	Brain Injury and Schizophrenia Awareness Scale
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Confidence Interval
CJJI	Criminal Justice Joint Inspectorate
CJS	Criminal Justice System
CM-TBI	Common Misconceptions of Traumatic Brain Injury
CT	Computer Tomography
EFA	Exploratory Factors Analysis
fMRI	Functional Magnetic Resonance Imaging
FWER	Family Wise Error Rate
GDP	Gross Domestic Product
HICs	High Income Countries
HIKS	Head Injury Knowledge Scale
ICD-10	International Classification of Diseases (10) Codes
ICF	International Classification of Functioning, Disability
JBS	Jury Bias Scale
LOC	Level of Contact
LMICs	Low to Middle Income Countries
MI	Mental Illness
ML	Maximum Likelihood
MOJ	Ministry of Justice
MRI	Magnetic Resonance Imaging
NGRI	Not Guilty by Reason of Insanity
OI	Orthopaedic Injuries
OR	Odds Ratio
OSF	Open Science Framework
PANAS	Positive and Negative Affect Scale
PAF	Principal Axis Factoring
PBIM	Perception of Brain Injury Measure
PBIS	Perceptions of Brain Injury Survey’
QCAE	The Questionnaire of Cognitive and Affective
RoCKAST-ST	Rosenbaum Concussion Knowledge and Attitudes
RMSEA	Root Mean Square Error of Appropriateness
RTA	Road Traffic Accident
SDS	Social Desirability Scale
SRMR	Standardised Room Mean Square Residual
TBI	Traumatic Brain Injury
TLI	Tucker Lewis Index
VMPC	Ventromedial Pre-Frontal Cortex
WHO	World Health Organization

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Chapter 1 Traumatic Brain Injury: Outcomes and Links to the Criminal Justice System

1.1 Chapter Overview

Traumatic brain injury (TBI) is a significant global public health issue which can lead to many, and varied, long-term consequences for survivors, their families, and/or caregivers. The first aim of this Chapter is to provide an overview of TBI as a significant public health issue, including a discussion of prevalence, prognosis, and outcomes. The second aim of this Chapter is to explore the links between TBI and the criminal justice system (CJS), including the prevalence of TBI in prison populations and the relationships between TBI, recidivism and violent crime. The importance of brain injury screening on prison entry will also be emphasised, alongside the need to assess for TBI disability at a much earlier point in the criminal justice system (CJS), such as before prison entry and when key legal decisions are made. Notably, little research has directly examined how important legal decisions, including sentencing recommendations, are made about defendants with a known history of TBI.

1.2 Traumatic Brain Injury: Definition and Global Impact

Defined as *"an alteration in brain function, or other evidence of brain pathology, caused by an external force"* (Menon et al., 2010), TBI is a is a serious global public health issue (Haarbauer-Krupa et al., 2021) and is a leading cause of trauma-related death and disability globally (Dewan et al., 2018; Rubiano et al., 2015). Worldwide, an estimated 69 million new cases of TBI occur each year (Dewan et al., 2018), of which approximately 5.5 million are classed as severe (Iaccarino et al., 2018).

Owing to ageing populations (i.e., resulting in higher rates of falls), as well as increased use of motor vehicles, bicycles, and motorbikes, rates of TBI are rising - albeit with variation across high and low-middle income countries (James et al., 2019). Furthermore, the consequences of TBI are not just limited to the person who has sustained a TBI; there are wide-reaching effects for families and caregivers, as well as broader social and economic consequences (Everhart et al., 2020; Iaccarino et al., 2018; Parsonage, 2016). Economically, for instance, TBI costs the UK economy around £15 billion a year, equivalent to approximately 0.8% of the Gross Domestic Product (Parsonage, 2016). These figures consist of direct (e.g., health and social care) and indirect (e.g., loss of output through employment) costs (see Humphreys et al., 2013). However, though the global burden of TBI is high, poor societal awareness of TBI and low detection rates render it a 'silent' epidemic (Hyder et al., 2007; Rusnak, 2013; The Lancet Neurology Editorial, 2010).

1.3 Causes of TBI Injury

TBI is caused by a sudden event or trauma, such as a blow to the head, a sudden jolt, or a penetrating injury (Faul et al., 2010). The most common types of incidents associated with TBI include sports-related accidents, falls, road traffic accidents (RTAs), and assaults (Haarbauer-Krupa et al., 2021) - including domestic violence (K. Costello & Greenwald, 2022). Global trends indicate that falls and road traffic accidents (RTAs) are the two primary causes of TBI in adults and children (Brazinova et al., 2021; Dewan et al., 2016), albeit with variation across countries (James et al., 2019). In Europe, falls are the most common cause of TBI where improvements in road safety have reduced the prevalence of RTA-related TBI (Brazionova et al., 2021). In contrast, RTAs remain the primary cause of TBI in low-middle income countries (LMICs: Iaccarino et al., 2018). Further, whilst there is a high TBI burden across both LMICs and HICs (Peeters et al., 2015), LMICs are disproportionately impacted by a greater burden of TBI mortality and morbidity – a consequence of poorer road safety (Iaccarino et al., 2018). Indeed, total cases of TBI are three times higher in LMICs compared to HICs, and 93% of global road related deaths occur in LMICs (Dewan et al., 2018; Iaccarino et al., 2018). Despite this, a disparity exists whereby LMICs have substantially lower levels of research outputs related to TBI (less than 3%) compared to HICs, as well as poorer quality data to comprehensively evaluate TBI associated burden (Tropeano et al., 2019).

1.4 Epidemiology, Incidence, Prevalence and Risk Factors

In the UK, and mirroring global trends, the estimated incidence of brain injury has increased by 10% over the last decade (James et al., 2019; Menon & Bryant, 2019). Yet, inconsistent definitions of TBI and variability in data collection methods have hindered efforts to estimate incidence (Brazinova et al., 2021; Roozenbeek et al., 2013; Thurman et al., 2007). In research settings and clinical practice, a variety of methods are used to diagnose TBI. These include clinical observations, International Classification of Diseases (ICD-10) codes, as well as established scales such as the Head Injury Severity Scale (Peeters et al., 2015). Epidemiological studies commonly rely on hospital data to calculate incidence rates, although the lack of common standards to diagnose TBI has led to considerable variability in estimates. For example, estimated case rates range from 101-326 per 100,000 across high- income countries (e.g., Heskestad et al., 2009; Koskinen & Alaranta, 2008; Peeters et al., 2015), and estimates vary considerably across countries (Brazinova et al., 2021). To assess the overall impact of TBI across Europe, Peeters et al. (2015) conducted a meta-analysis combining incidence-related data from hospitals from 16 European countries. They found an overall incidence rate of 262 per 100,000 which increased to 326 per 100,000 when data outliers were removed (Peeters et al., 2015).

Hospital records may be reasonably accurate at identifying the most serious cases of TBI where hospitalisation has occurred, but may lead to underestimation of mild TBI (Cassidy et al., 2004; Hyder et al., 2007). In New Zealand, Feigin et al. (2013) captured information from multiple community sources in addition to hospital records, with the aim of more accurately estimating TBI incidence. This method led to a considerably higher estimated incidence rate (790/100,000) than other studies (see Peeters et al., 2015), likely owing to the identification and inclusion of non-hospitalised TBI cases. Thus, this demonstrates how the global case rates reported earlier are likely to underestimate incidence of TBI (Feigin et al., 2013).

Rates of TBI also vary according to sociodemographic factors (e.g., socioeconomic status, age, and housing status), with some groups in society at greater risk of TBI than others (Dewan et al., 2016; Hyder et al., 2007; Iaccarino et al., 2018). For example, one study found that TBI was present in 43% of those currently homeless, with injuries commonly occurring prior to the onset of homelessness (Mackelprang et al., 2014). Additionally, TBI is more prevalent in low socioeconomic status groups (Kisser et al., 2017). Indeed, Parslow et al. (2005) found that children admitted with TBI to UK paediatric intensive care units tended to be from less affluent areas compared to the whole population. Such findings appear to reflect health inequalities more broadly, whereby low socioeconomic status is linked to poorer mental and physical health (see Marmot, 2005).

Even so, whilst rates of TBI vary according to housing status and socioeconomic status, other sociodemographic factors also appear to be important (e.g., age and gender). Cassidy et al. (2004) reviewed 121 studies investigating the incidence of, and risk factors for, TBI. Overall rates of mild TBI were approximately twice as high in men than in women, and younger adults and teenagers had a higher risk of TBI than any other age category (Cassidy et al., 2004). In adolescents and younger adults (aged 15-24 years), RTAs represent the most common cause of TBI injury, whereas falls are the most common cause in the elderly (over 75 years) and children (under 4 years; see Haarbauer-Krupa et al., 2021). A recent UK-based study found that 24.8% of TBI-related hospital visits were for older people (over 65 years), with falls accounting for most of these injuries (Hawley et al., 2022). Additionally, Dewan et al. (2016) conducted a systematic review of global research in paediatric populations, finding that TBIs peaked in early childhood (0-2 years) and late adolescence (15-18 years). Similar to Cassidy et al. (2004), they also found that males had higher case rates than females, but only once the children had reached three years of age.

Finally, environmental factors also significantly contribute to TBI prevalence (Chen et al., 2022). For example, TBI injuries in children are more prevalent during the summer months and during late afternoon/early evenings (Parslow et al., 2005). Thus, prevention strategies should take account of environmental considerations (Chen et al., 2022) in conjunction with sociodemographic factors.

1.5 Classification of TBI, Prognosis and Outcomes

Following assessment, cases of TBI are typically categorised as either mild, moderate, or severe (see Brazinova et al., 2021; Maas et al., 2005). Such distinctions can be useful for predicting outcomes following injury (Ono et al., 2001) and are often defined by how long the individual experiences loss of consciousness (LOC) or post-traumatic amnesia (Parsonage, 2016). Various scales exist to measure the severity of TBI, including the Glasgow Coma Scale (GCS; Teasdale and Jennett, 1974) and the Abbreviated Injury Scale (AIS-2005; Gennarelli & Wodzin, 2006). The estimated proportion of all TBIs that are moderate or severe ranges from 5% to 15%, with the remaining 85% to 95% categorised as mild (Feigin et al., 2013; Parsonage, 2016).

Approximately 12% of the population have a history of TBI (Frost et al., 2013) and, applying the same parameters (through statistical models) used to calculate figures in the US (Thurmann et al., 1999), a report by the Centre for Mental Health estimated that 1.3 million people are likely to be living with TBI-related disability in the UK alone (Parsonage, 2016). Whilst persistent physical impairments (e.g., fatigue, headaches, nausea, and dizziness) can be common following injury, TBI is also associated with 'hidden' cognitive, emotional, and behavioural difficulties (M. Smith, 2003). Cognitive impairments include disruptions to executive functioning (e.g., planning, and decision-making processes), memory, and attention (Mateer & Sira, 2006; H. Williams, 2012). Emotional and behavioural changes include poor impulse control, behavioural disinhibition, and emotional dysregulation, which can lead to irritability, anger, and aggression (Alderman, 2007; Alderman et al, 2013; M. Smith, 2003; C. Williams & Wood, 2017). Historically, recovery after a mild TBI was mostly considered favourable, with physical symptoms typically resolving quickly over a few weeks, and low evidence of long-term hidden consequences (Carroll et al., 2004). However, in more recent years, greater attention has been paid to the chronic effects of mild TBI (McCrea et al., 2009). Advancements in neuroimaging research have led to greater understanding that type and location of injury, along with vulnerabilities to repeat injuries, are important factors in determining long term outcomes after mild TBI (Bigler, 2021; Yuh et al., 2021). For moderate to severe TBI, long-term outcomes can be poor and can fluctuate over the lifespan of the individual (J.D. Corrigan & Hammond, 2013; Masel & DeWitt, 2010; Wilson et al., 2017). More broadly, TBI has also been linked to neurodegenerative diseases and early mortality (Wilson et al., 2017).

1.6 Neurobehavioural Sequelae after TBI: Recovery, Mechanisms and Pathophysiology

The term 'neurobehavioural disability' has been used to represent the broad range of impacts to the individual that often follow TBI (C. Williams et al., 2020; R. Ll. Wood, 2001), which vary according to pre- and post-injury factors as well as location of injury and severity of TBI impact (Worthington et al., 2017). Up to the first six months post injury, signs of continuous recovery are typically present, particularly in relation to physical recovery (Stocchetti & Zanier, 2016). However, recovery characteristically levels off after this, where longer-term signs of persistent neurobehavioural disability become more apparent (Stocchetti & Zanier, 2016).

Accordingly, social functioning and relationships are often impacted after TBI (C. Williams & Wood, 2013; R. Ll. Wood & Yurdakul, 1997), with many individuals experiencing significant difficulties empathising with the emotional needs of others following injury (C. Williams et al., 2020; C. Williams & Wood, 2010, 2017; R. Ll. Wood & Williams, 2008). Additionally, individuals with neurobehavioural disability can also struggle to secure and retain employment, increasing the risk of long-term unemployment (see Stocchetti & Zanier, 2016). The neurobehavioural effects of TBI can also have a disabling impact on community reintegration, whereby returning to normal leisure activities are impacted because of the ongoing cognitive, emotional, and behavioural consequences (J.D. Corrigan & Hammond, 2013; Stocchetti & Zanier, 2016; Temkin et al., 2009; C. Williams et al., 2020). These neurobehavioural consequences, combined with disrupted social functioning, can lead the person with TBI to feel a loss of self-identity and a sense of loss of their role in society (Morris et al., 2005), leading to social handicap (Alderman, 2007; Alderman et al., 2013, 2017; McMillan & Wood, 2017).

Thus, TBI can result in persistent neurobehavioural sequelae, albeit with the presentation of symptoms and consequences varying depending on the area of brain damage and severity of injury (Ponsford & Dymowski, 2017). There are two main types of injuries associated with TBIs: (1) focal injuries (e.g., a consequence of direct contact) and (2) diffuse brain injuries (e.g., a consequence of acceleration or deceleration motion). Focal injuries can cause contusions and intracranial haemorrhage, whereas diffuse brain injuries can cause brain swelling and diffuse axonal injury (Werner & Engelhard, 2007). Commonly, both types of injuries occur together (M. Smith, 2003) with evidence suggesting that moderate-severe TBI particularly, leads to gradual focal or diffuse brain atrophy (Harris et al., 2019).

Frontal lobe regions are commonly damaged when a TBI event occurs and damage to specific areas of the frontal lobes in the brain, such as the ventromedial pre-frontal cortex (VMPC), can alter executive functions. Damage to the VMPC can also alter a person's decision-making capabilities (see Bechara & Van Der Linden., 2005; Damasio, 1994). Importantly, the VMPC is vital for social planning and decision-making (Clark & Manes, 2010), and thus damage to this area of the brain can also lead to marked changes in personality and social behaviour (Bechara & Van Der Linden., 2005). Additionally, axonal damage in the fronto-limbic pathway is associated with mood and behavioural changes, including agitation and poor behavioural control (M. Smith, 2003). Indeed, aggression and poor emotional regulation are also commonly associated with TBI (Alderman, 2007; Alderman et al., 2013; Buckley et al., 2017; H. Williams et al., 2018). Thus, the neurobehavioural consequences of TBI will also be dependent on the site, and severity, of damage to different brain structures – albeit typically involving the frontal lobes which disrupt executive functions.

Importantly, the frontal lobes develop at a later stage in brain development than other brain regions, with maturation often not complete until an individual is in their mid-twenties (Spear, 2012; Weinberger et al., 2005; H. Williams, 2012). Thus, a TBI sustained in childhood, before brain maturation occurs, can increase the risk of poor long-term outcomes and can alter an individual's life trajectory (Babikan et al., 2015). However, disruption to brain maturation because of TBI may not be immediately obvious. Rather, these long-term consequences may become evident over time as skill development and learning diverges from an expected trajectory (Babikan et al., 2015).

1.7 Comorbidities

Common comorbidities in persons with TBI include mental health issues, neurodevelopmental disorders, and substance abuse (Hughes et al., 2015). Importantly, some of these comorbidities, such as neurodevelopmental disorders (e.g., attention deficit hyperactivity disorder), commonly *precede* the TBI and so can be risk factors for sustaining a TBI (see Hughes et al., 2015). Other comorbidities, such as anxiety, depression, and suicidal ideation, commonly follow the onset of the TBI (see Hughes et al., 2015). Here, TBI can lead to social isolation, which then causes depression and changes in mood (e.g., Stocchetti & Zanier, 2016), which can then increase the risk of suicide and suicidal thoughts (R. Ll. Wood et al., 2010; Stubbs et al., 2020). In females, TBI has also been frequently associated with post-traumatic stress disorder post-injury, particularly when the TBI is sustained in the context of domestic violence (PTSD; McMillan et al., 2021). Substance abuse is also recognised as a comorbidity with TBI (McMillan et al., 2021), which can either precede or follow the TBI. For instance, Kennedy et al. (2017) found that TBI sustained in childhood or adolescence was linked to problematic use of alcohol and cannabis by the age of 17 years (Kennedy et al., 2017). Thus, comorbid disorders are an important consideration in the context of TBI and may contribute to poorer long-term outcomes (see section *1.9.1 TBI Prevalence in Prison Population and Risk Factors* below).

1.8 Caregivers and Family Context of TBI

In addition to the impacts experienced by survivors themselves, caregivers and family members of those who have sustained a TBI are also often significantly affected (Everhart et al., 2019; Kratz et al. 2017; Manskow et al., 2015; C. Williams

& Wood, 2013). TBI is a life-changing event which occurs suddenly and is therefore accompanied by a lack of preparedness (Everhart et al., 2019; Kratz et al. 2017). Kratz et al. (2017) interviewed caregivers of children and partners who had sustained a TBI to explore the impact of caring on the caregiver's quality of life. Grieving a change in the person with TBI was a dominant theme in this research. Indeed, a change in personality is a common occurrence after TBI and linked to damage in the frontal lobes (Bechara & Van Der Linden., 2005). Furthermore, caregivers often felt overburdened with their caring responsibilities and reported a lack of time to look after their own needs (Kratz et al., 2017). Similar to persons who have sustained TBI themselves, caring for a person with TBI disrupts the social functioning of the caregiver, which subsequently impacts their own employment or educational activities, and in turn, can result in financial difficulties (Everhart et al., 2019; Kratz et al., 2017). Caregiver burnout can occur as a result of these demands and can lead to psychological consequences such as anxiety and depression (see Everhart et al., 2019). The consequences of TBI can also lead to strain on marital relationships and poor marital satisfaction, potentially leading to marriage dissolution (see Krutzer et al. 2007; C. Williams et al., 2020; C. Williams & Wood, 2013; R. Ll. Wood & Yurdakul,1997). Furthermore, C. Williams & Wood (2013) found that uninjured spouses reported lower levels of marital satisfaction than their injured spouse, potentially reflecting a lack of insight and awareness following TBI. Thus, TBI can also lead to life-altering changes for caregivers, but as levels of insight are often affected by TBI, such consequences are not always recognised by the TBI survivor.

So far, the focus of this Chapter has been on understanding TBI as a global public health issue, together with its impacts on survivors as well as their families. However, there are also broader societal consequences of TBI, such as an overrepresentation of TBI amongst people who have offended. Therefore, the remainder of this Chapter will focus on exploring some of the mechanisms which may help explain why those with TBI are more likely to end up on a journey through the CJS than individuals without a history of TBI.

1.9 TBI in the Criminal Justice System

There are approximately 88,000 people currently incarcerated in prisons in the UK (Sturge, 2020). The introduction of lockdown measures during the early part of the COVID-19 pandemic led to a dip in prison population figures, although long-term trends indicate that prison population numbers have gradually increased over time - with this pattern expected to continue in the coming years (Sturge, 2020). Elevated rates of serious health issues and disabilities in prison populations are of national and international concern (see Hayton et al., 2010). Many people enter prison with poor health and complex health needs, partly attributable to the fact that they are more likely to come from socially disadvantaged backgrounds where health inequalities are greater (Heard, 2019). Mental health difficulties, drug and alcohol dependency, and intellectual disabilities are common health needs on prison entry, although they are often underdiagnosed (Fazel et al., 2009, 2016, 2017; Heard, 2019). The prevalence of dual disorders amongst prisoners is also high (Wainwright & Dawson, 2022), with a recent review of prison population studies indicating that 49.2% prisoners with non-affective psychosis and 51.6% with major depression had comorbid substance abuse disorders (Baranyi et al., 2022). Globally, suicide represents the leading cause of mortality in prisons, with those with dual disorders at increased risk (Wainwright & Dawson, 2022). However, some complex health needs have largely been overlooked in the context of prison populations and criminal justice, including TBI (e.g., Witzel et al., 2016). Therefore, the next section will consider the current evidence pertaining to TBI in the CJS.

1.9.1 TBI Prevalence in Prison Population and Risk Factors Researchers investigating rates of TBI in the CJS have screened for TBI within prison settings to establish prevalence rates. This has led to a growing body of evidence demonstrating that TBI is a pervasive health issue in prison settings (e.g., Farrer & Hedges, 2011; Hughes et al., 2015; Pitman et al., 2015; Shiroma et al., 2010; H. Williams, 2012; W.H. Williams et al., 2018). In the UK, one study found that 47% of those screened on prison entry to a closed category B prison (awaiting allocation or on remand) reported a history of TBI, with 70% occurring before the first criminal offence (Pitman et al., 2015). The finding that the TBI preceded the offending behaviour suggests that TBI is a potential contributing factor in subsequent offending behaviour. Furthermore, Farrer and Hedges (2011) pooled TBI estimates from numerous studies – including data from both adult and juvenile populations - resulting in a lifetime prevalence of 51% in people who have offended. Additionally, a systematic review by Hughes et al. (2015), which included 10 studies, found high rates of TBI amongst young people who have offended (e.g., 16.5% – 72.2%). Notably, in one of the American studies included in the review, 100% of those sentenced to death (N=14) reported a history of TBI (Hughes et al., 2015). A further meta-analysis estimated the prevalence rate of TBI to be 60.25% in the overall prison population, but this was based on studies focussed on adults who had offended (Shiroma et al., 2010). To put these figures in context, the prevalence rate of TBI in the general population has been reported to fall between 2% - 38.5%. Therefore, whilst estimates are inconsistent and vary across studies, the rate of TBI is proportionally much higher in prison populations (Farrer & Hedges, 2011).

Explanations for these inconsistencies mirror difficulties faced generally in epidemiological research on TBI. For example, whilst rates of TBI in prison populations are likely to influenced by factors such as prison type (e.g., prisons for young people who have offended, adult prisons) and geographical location of where the studies were conducted, some of this variability may also be accounted for by varying definitions of TBI being adopted across studies (see Hardcastle, 2015; Hughes et al., 2015). Similarly, small sample sizes together with differences in study selection criteria (e.g., whether adult versus juvenile populations were included) in meta-analyses (Farrer & Hedges, 2010) may also contribute. Therefore, whilst having a TBI is clearly associated with increased offending-related behaviour and thereby imprisonment, the exact prevalence of TBI in prison populations is less clear. This may be due to natural variations in prevalence rates and/or the different research methodologies adopted.

Further, while having a TBI is associated with an increased risk of imprisonment (Farrer & Hedges, 2011), what is less clear from the evidence is whether TBI is a casual factor in the offending behaviour that leads to subsequent incarceration (Durand et al., 2017; Perron & Howard, 2008), or whether TBI is a catalyst that interacts with other known risk factors to increase risk of incarceration. For example, TBI could add to greater risk of criminality by increasing the likelihood of problem behaviour and eroding capacity for self-regulation and social cognition (C. Williams et al., 2020; W. H. Williams et al., 2018). Thus, some of the neurobehavioural consequences of TBI may be responsible for negative behaviours, which may then lead on to offending.

A further complication is that TBI is often comorbid with other disorders, such as substance misuse and mental health difficulties, which are also overrepresented in prison populations. For example, a systematic review by Durand et al. (2017) found that several comorbidities (e.g., anxiety, depression, alcohol related problems) were frequently found amongst prisoners with a reported history of TBI. W.H. Williams et al. (2010) also found that young males who offend, who have sustained a TBI, used more cannabis than those without a history of TBI. It is thus important to consider the additional risk of offending behaviour that is associated with TBI and comorbid conditions. For example, compared to those without a reported history of TBI, Kennedy et al. (2017) found that the link between TBI and committing offences (OR= 1.72 vs 1.29) or getting into trouble with the police (OR = 1.62 vs 1.17) was reduced when substance use was taken into consideration. Therefore, other factors related to the TBI may be a shared risk factor for subsequent offending behaviour.

So far, studies which have focused on identifying prevalence rates of TBI in prison populations can only point to the association between the TBI and offending behaviour, with insufficient evidence available in prison population surveys to identify TBI as a causative factor in criminality. Consideration therefore needs to be paid to the timeline and circumstances of the individual, and whether existing offending and risky behaviours increase the chances of sustaining a TBI or alternatively, some shared social factors increase the risks of both offending and TBI occurring (see Durand et al., 2017; Farrer & Hedges, 2011).

1.9.2 Prospective, Population and Data Linkage Studies

Prospective studies, which establish a timeline of TBI and criminal offending for a large group of individuals, may help elucidate the causal mechanisms that underpin the relationship between TBI and incarceration. Timonen et al. (2002) conducted a large (N= 11,017) prospective study in Finland whereby a birth cohort was followed for over 30 years. By the age of 15, 2.7% of males and 1.9% of females had received a medical diagnosis of TBI. After controlling for some socio-demographic factors such as social class and mothers' marital status, Timonen et al. (2002) found that childhood-sustained TBI elevated the risk of both criminality (unadjusted odds ratio [OR] 1.6, 95% CI 1.0-2.5) and mental health problems (unadjusted OR 2.1, CI 1.2–3.6) for males in later adult life. Notably, and despite TBI being a known risk factor for psychiatric disorders (e.g., Deb et al., 1999), a record of the TBI was only reported in 30% of psychiatric notes for those who had offended with a history of psychiatric problems, and no clinical notes indicated that the TBI had been considered (Timonen et al., 2002). Although, whilst Timonen et al. (2002) showed that early TBI led to an increased risk of criminality in adult life, the immediate social context of the individual was not taken into consideration in the research findings, thus limiting interpretation. Subsequent research in Sweden using a sibling match as a comparison group to help control for possible confounding factors, found that a diagnosis of TBI led to a three-fold risk of engaging in violent crime compared to the general population (Fazel et al., 2011). This risk was reduced, but not eliminated, when familial confounding factors were controlled for by matching those with a TBI to siblings without a TBI. Therefore, this finding suggests that there is a direct, causal relationship between TBI and subsequent violent crime (Fazel et al., 2011).

Even so, though research has demonstrated a direct link between TBI and criminality, attention also needs to be given to the risk factors which make offending behaviour more likely. One area of significant interest is the link between age of TBI acquisition (i.e., age of injury) and criminal behaviour. For example, Timonen et al. (2002) found that a TBI sustained prior to the age of 12 years was linked to earlier onset of offending behaviour. Similarly, Pitman et al. (2015) found that 41% of prisoners with TBI reported committing their first offence prior to the age of 18 compared to only 20% of prisoners without a history of TBI. However, contrasting findings have been reported. For instance, Fazel et al (2011) reported that a TBI sustained prior to the age of 16 led to lower rates of violent crime compared to a TBI sustained in adulthood (defined as over the age of 16; Fazel et al., 2009). However, as Timonen et al., (2002) specifically focused on TBI acquired in childhood (< 15 years) and all forms of criminal behaviour, whereas Fazel et al.'s (2009) study focused solely on violent crime, making direct comparisons across studies is problematic. A review of the literature by W.H. Williams et al. (2018), however, concluded that TBI appears to be linked to earlier onset of criminality and a higher risk of committing violent crimes.

Further, research suggests that childhood acquired TBI is not only linked to early onset of offending behaviour and violent crime, but also increased risk of non-violent crime. For example, a Finnish population-based study assessed the criminal behaviour of 508 adolescents who had been admitted for inpatient psychiatric support (aged 12 – 17 years; Luukkainen et al., 2012). Of these, 5.1% (26/508) were identified through hospital records as having received treatment for a TBI (either a skull fracture, intracranial injury, or cranial nerve injury). Patients who had sustained a TBI in childhood and adolescence, were more likely to have engaged in criminal behaviour during adolescence. This elevated risk was present for both violent (42.9% vs. 9.1%) and non-violent (9.4% vs. 6.8%) crimes (Luukkainen et al., 2012), and compared to patients without a history of TBI, childhood and adolescent onset of TBI was found to elevate the risk of criminality nearly seven-fold for both violent and non-violent crimes. The risk increased to nearly 19-fold when concomitant conduct disorder and criminality were considered together (Luukkainen et al., 2012). Although notably, generalising to a general population adolescent group is difficult, given that rates of criminality were assessed within an inpatient psychiatric setting (see Luukkainen et al., 2012).

While it is difficult to extrapolate findings from psychiatric settings to non-psychiatric settings, other UK based longitudinal birth cohort studies have explored the impact of childhood sustained mild TBI on outcomes in later adolescence (Kennedy et al., 2017). At the age of 17, Kennedy et al. (2017) found that those with a history of TBI were more likely to self-report problematic use of nicotine, cannabis, and alcohol. They also had a higher risk of criminality (e.g., getting into trouble with the police) and conduct disorder than those without a history of TBI. However, when participants with TBI were compared to participants who had experienced orthopaedic injuries (OI), which was included as a relative control condition, both TBI and OI were found to lead to increased risk of criminal behaviour compared to those without any OI or TBI. Whilst this was a surprising finding in the study, the authors concluded that there may be some shared risk factors responsible for causing both the physical injury (i.e., either the TBI or OI) and offending behaviour (Kennedy et al., 2017). Age at injury was also shown to impact later outcomes. For example, psychiatric difficulties were associated with earlier onset of TBI (<11), whereas a TBI sustained later in adolescence (12-16 years versus birth to 11 years) was associated with greater risk of criminal behaviour and substance abuse (Kennedy et al., 2017). Overall, therefore, a general pattern has emerged indicating that a TBI sustained in childhood or adolescence increases the likelihood of offending behaviour in later life (Kennedy et al., 2017; see also Menon & Bryant, 2019). However, evidence for the specific timepoint in childhood or adolescence, at which TBI causes the greatest risk of later criminality, remains inconclusive.

1.9.3 TBI and Recidivism

As well as increasing the risk of crime perpetration, evidence also indicates that TBI may lead to a heightened risk of recidivism (i.e., repeat offending; Luukkainen et al., 2012; Ray & Richardson, 2017; W.H. Williams et al., 2010). In a retrospective study of young males who had offended between the ages of 11 and 19, W.H. Williams et al. (2010) explored self-reported rates of TBI and whether conviction rates were associated with TBI. They found that the frequency of TBI was associated with a greater number of convictions, and that a higher frequency (> 3) of TBIs was also linked to more violent crime (W.H. Williams et al., 2010). Whilst this study was reliant on retrospective self-report data, the findings were largely replicated in a subsequent prospective study carried out in the US. Ray and Richardson (2017) found that people who had offended who screened positive for TBI within a month of being incarcerated were 1.57 times more likely to reoffend during a 12-30 month follow up period, but also sooner after their release than those without a TBI. Furthermore, those with TBI had more previous arrests (8.04 vs 5.73) and were more likely to have carried out a person offence (e.g., assault) than those without a TBI (Ray & Richardson, 2017). At 12 months follow-up, the reoffending rate was 48.15% for those with TBI compared to 37.11% for those without TBI - where both rates far exceed the reoffending rate of 23.1% reported by the Ministry of Justice (MOJ) in 2022 (*Proven Reoffending Statistics: October to December 2020*, 2022). Even so, it is worth noting that recidivism rates generally vary depending on the age of the person who has offended (i.e., juveniles have higher reoffending rates) and sentencing length (*Proven Reoffending Statistics: October to December 2020*, 2022). In summary, TBI seems to be related to a higher risk of recidivism although the causal mechanisms have yet to be elucidated.

Further, and despite the documented high risk of recidivism in those who have offended with a history of TBI (e.g., W.H. Williams et al., 2010), prisoners themselves report positive expectations of social re-integration following release from prisons (Linden et al., 2021), suggesting that they do not necessarily recognise the links between their own TBI and their offending behaviour. Linden et al. (2021) conducted semi-structured interviews with 37 male and 17 female prisoners with TBI, who had been screened using the Brain Injury Screening Index (BISI: see Pitman et al., 2015). Prisoners' post-release expectations for returning into society centred around employment, education, and family life, although not all participants had considered their goals and expectations after prison. Moreover, few had considered the barriers that they may face in achieving their goals, particularly in relation to any co-occurring drug and alcohol use and mental health difficulties. A further complication detected in this study was the poor recognition of their brain injury and any possible ongoing consequences of this, despite the person's reports of sustaining injuries during screening assessment using the BISI (Linden et al., 2021). This finding has been replicated in a sample of females who had offended, who, despite reporting that they had sustained a TBI during a screening assessment, did not recognise that this was in fact classed as a brain injury (e.g., O'Rourke et al., 2018b). Therefore, whilst expectations after prison can be positive and focused on good social outcomes, poor recognition of the long-term impacts of brain injury together with comorbid conditions (e.g., drug and alcohol dependency, co-occurring mental ill health) pose difficulties for those who have offended with a history of

TBI. Thus, although people who have offended with a history of TBI may have positive expectations about reintegrating back into society after they leave the prison setting, there is a potential discrepancy between this expectation and the broader social barriers they may face (e.g., poor mental health, drug and alcohol dependence). Equally though, such social barriers may also be a contributory factor in subsequent reoffending.

1.9.4 Females with TBI in the CJS

Given the general predominance of males in prison populations, most studies exploring TBI in the CJS have focused on males who have offended who with a history of TBI. In the UK, only 4% of those currently incarcerated in prisons are female (Sturge, 2020). However, the percentage of female prisoners is rising, and women in the prison system are often vulnerable and have complex health needs (see McMillan et al., 2021). Studies examining the prevalence of TBI in females who have offended have found comparable rates between males (64.41%) and females(69.98%; Shiroma et al., 2010). This similarity in rates is important considering the higher rates of TBI in males in the general population compared to females (ratio 2:1; Frost et al., 2013). A further small-scale study (n = 29) found a prevalence rate of 79% for TBI amongst females who have offended, with this figure comparable to the prevalence of 78% found in McMillan et al.'s (2021) Scottish study. Furthermore, 38% of the female people who offended in O'Rourke et al.'s (2018b) study reported six or more TBI injuries. Using the BISI index, most cases of TBI were considered mild; however, long-term neurobehavioural sequelae were more likely after multiple mild TBI injuries and in turn, more likely to lead to significant neurobehavioural disability. Evidence of moderate to severe neurobehavioural disability was found in 40% of those who offended with a history of TBI in McMillan et al.'s study (2021), although 84% of those with TBI reported multiple injuries (McMillan et al., 2021) - meaning that whilst disability was common after TBI, it was not present in all cases.

In relation to the characteristics of females who have offended with a history of TBI, O'Sullivan et al. (2021) found that the principal cause of TBI was domestic abuse. This finding is consistent with other studies focusing on TBI in females (e.g., Durand et al., 2017; McMillan et al., 2021; O'Rourke et al., 2018b), but contrasts the primary causes of TBI overall (e.g., falls, RTAs; Brazionova et al., 2021). However, consistent with evidence in males who had offended, TBI often preceded offending behaviour (O'Sullivan et al., 2021); a finding that was also replicated by O'Rourke et al.(2018b). Consistent with males, females who had offended with a history of TBI were also more likely to reoffend and to commit violent offences than those without TBI (O'Sullivan et al., 2021). For example, McMillan et al. (2021) found that females who had offended with a history of TBI had spent three times longer in prison than those without TBI. The fact that females who had offended with a history of TBI commit more violent crimes than those without a history of TBI is consistent with behavioural impacts associated with lack of emotional regulation and higher levels of aggression after TBI (McMillan et al., 2021). Comorbidities with substance abuse and mental illness (e.g., PTSD) have also been found in females who have offended with a history of TBI (McMillan et al., 2021). Thus, given the vulnerabilities of women in prison generally, and the more complex picture that is associated with females who have offended with a history of TBI, the specific needs of female prisoners need further investigation and attention.

1.9.5 Screening for TBI in the CJS

So far, the discussion has focused on understanding the scale of TBI amongst male and female incarcerated populations, the likelihood of recidivism after TBI, and the possible underlying mechanisms linking TBI to offending behaviour. However, it is also important to understand the different screening procedures that have been adopted to identify the presence of TBI amongst populations who offend. For instance, neuroimaging studies have been carried out within forensic settings to examine the presence or absence of TBI. Witzel et al. (2015) found high levels of previously undetected brain anomalies in prisoners and forensic inpatients. To establish this, brain scans were performed on forensic inpatients using magnetic resonance imaging (MRI) and computer tomography (CT) after complaints of symptoms typically associated with brain damage (e.g., headaches, vertigo). The findings revealed that, compared to the scans of healthy controls without a history of incarceration, more evidence of brain damage was seen in the forensic inpatients (Witzel et al., 2015). A similar study, which used MRI and CT brain scans to assess brain structures in persons who committed violent offences compared to non-violent offences and healthy controls, found higher levels of brain damage to temporal and frontal regions in the group who committed violent offences compared to either of the two comparison groups (Schiltz et al., 2013). Such findings support earlier indications that TBI is linked to violent offences.

Evidence from neuroimaging studies provide useful insights about the presence of TBI in incarcerated populations, but they require technical equipment and expertise to interpret (Suskauer & Huisman, 2009). Consequently, there have also been attempts to develop more accessible and time efficient screening tools, such as the 11–item self-report BISI (Pitman et al., 2015; Ramos et al., 2020). Similar to neuroimaging studies (e.g., Witzel et al., 2015), the BISI is designed to detect the presence of TBI. The sensitivity of this tool to the detection of TBI, confirmed through examination of medical records, is modest to good, however, the specificity of the BISI is poor to good. Although poorer specificity than sensitivity could potentially be due to people not seeking medical assistance at the time of injury TBI (Ramos et al., 2020). Thus, screening alone may not sufficiently identify the presence and severity of neurobehavioural disability (McMillan, 2016), but it provides the opportunity for those working with people who have offended to recognise that a TBI may be present. However, even though the BISI has been established and validated in prisoner populations (Pitman et al., 2015; Ramos et al., 2020) to capture TBI history at prison entry, there are multiple timepoints and opportunities during a person's journey through the CJS to provide earlier screening. Doing so provides an opportunity to assess for TBI disability *before* a person reaches prison, so that it can be taken into consideration *earlier* and importantly, when key legal decisions (e.g., sentencing decisions) are made.

1.9.6 TBI in the CJS: Conclusion

The evidence is unequivocal that TBI is highly prevalent in prison populations for both males and females. Criminality and TBI have been directly linked (Fazel et al., 2011), with early onset of TBI a likely risk factor for later criminal behaviour (see W.H. Williams et al., 2010). Elevated rates of reoffending have also been reported in those with TBI (Ray & Richardson, 2017) and this is the case for both males and females (O'Rourke et al., 2018b). However, what remains uncertain is how TBI fits into an individual's pathway to criminal behaviour and subsequent reoffending. This is partly because evidence for the wider social context of the individual is often incomplete. Furthermore, few studies have included appropriate comparison groups (e.g., Timonen et al., 2002; W.H. Williams et al., 2010) and most research to date has largely been restricted to prison populations and prospective studies focusing on links between TBI and criminality. Consequently, very little research has explored TBI in other areas of the CJS. For instance, tools such as the BISI have helped to identify TBI in prison populations (e.g., Pitman et al., 2015), but little research exists which has assessed rates of TBI at an *earlier* point than on prison entry.

Furthermore, TBI is frequently reported when people enter custody, yet this is seldom considered by police, or when sentencing decisions are made (Menon & Bryant, 2019). Earlier screening in the CJS pathway represents an opportunity to consider appropriate interventions (Schofield et al., 2006) and raises the possibility of implementing court diversion schemes (Heard, 2019). Using such recommendations to implement a greater focus on treatment and rehabilitation for with people who have offended with a history of TBI may lead to better outcomes for these individuals (Brown et al., 2018), whilst reducing the socio-economic costs currently associated with TBI- related disability (Parsonage, 2016), including recidivism. Furthermore, people who have offended who may be experiencing ongoing neurobehavioural sequelae from a TBI, may have never received appropriate rehabilitation and support prior to incarceration (see McKinlay & Albicini, 2016). In the UK, Brain Injury Link worker services are being developed for those currently in prison, in part owing to the greater recognition that the prevalence of TBI is high in prisons and that individuals with brain injury will benefit from specialist support and management (see Mcmillan, 2016). Furthermore, the UK sentencing council now advises that TBI should be considered in sentencing decisions for young people who have offended (Sentencing Council, 2017). However, little research exists which directly explores how information about TBI is factored into legal decision making, including sentencing recommendations and how this may be impacted by decision-makers' perceptions and understanding of TBI.

1.10 Thesis Overview

High rates of TBI have been consistently evidenced amongst prison populations, with research clearly indicating that TBI and offending behaviour are not only inextricably linked, but that TBI may lead to earlier onset of offending behaviour and repeat offending. These findings have led to a concerted effort to understand the risk factors directly related to offending after a TBI (e.g., onset of TBI, comorbidities,) and subsequent incarceration. However, understanding the impact of TBI at an earlier timepoint in the criminal justice system than on prison entry is a neglected avenue of research. Robust screening practices and a heightened awareness of TBI from key decision-makers (e.g., magistrates, judges, and the police) is needed throughout the course of the CJS.

1.10.1 Thesis Aims

Currently, it remains unclear how information presented about TBI history, together with a decision maker's knowledge and understanding of TBI, impacts key legal decisions, including sentencing decisions. This thesis will consider how those with TBI are perceived in the context of the CJS with a particular focus on the UK magistrates' court system[1], a starting point for all criminal trials. Therefore, the overarching aim of this thesis is to investigate how information about TBI is evaluated and factored into sentencing recommendations when defendants are presented with a history of TBI.

[1] Whilst the aim of this thesis is to explore perceptions of defendants in the context of the magistrate's court system, the samples recruited for the experimental Chapters 6, 7 & 8 are drawn from the general 'lay' population rather than key legal decision makers in the CJS. Herein, across these three experimental chapters, participants are thus mock legal decision makers, evaluating fictional case materials ostensibly from a magistrates' court.

Chapter 1: Key Messages

- TBI is a serious global public health issue, which can lead to long term neurobehavioural consequences for survivors, but also has broader social and economic costs.
- TBI is overrepresented in prison populations, although the link between TBI and offending behaviour remains unclear.
- TBI screening is currently poor prior to prison entry, meaning that is unlikely to be taken into consideration by key decision makers at an earlier timepoint than on prison entry.
- It is recommended that TBI is factored into sentencing decisions, but little research has examined what effect presenting a defendant with TBI has on sentencing decisions, and how defendants with TBI are perceived by decision-makers.

Chapter 2 Social Perceptions of TBI: Misconceptions and Measurement

2.1 Chapter Overview

As outlined in Chapter 1, TBI is highly prevalent in prison populations (e.g., Farrer & Hedges, 2011; Hughes et al., 2015; Pitman et al., 2015; Shiroma et al., 2010; H. Williams, 2012), yet very little is known about how those with TBI are perceived more broadly within the CJS, or how perceptions of TBI and its invisible nature may impact on key legal decisions. However, before exploring what aspects of social perceptions may contribute to key legal decisions, it is first necessary to consider how disability – and TBI specifically - is viewed more broadly in society. This is important, because public understanding, perceptions and attitudes of disability may translate into behaviour towards individuals and groups in society which have negative and unwanted consequences. Therefore, the overarching aim of this chapter is to explore public knowledge, understanding and attitudes of disability and TBI specifically, before proceeding to review the tools adopted to capture such perceptions.

2.2 Disability: Global Perspectives

Globally, disability affects approximately 15.6% to 19.4% of the world's population from whom 2.2% to 3.8 % experience significant functional impairments (WHO, 2011; 2015). Disability, an umbrella term for many conditions and disorders, is viewed as an interchange between the person and their context (both environmental and personal) and encompasses impairments, limitations in activities, and participatory restrictions (WHO, 2002). During the life course of an individual, most will experience an impairment at some point which is either temporary or permanent in nature (WHO, 2011). Disability can cause severe disruption to a person's daily life, with many facing significant barriers in accessing appropriate healthcare and services, leading to worse health outcomes than those without disability (WHO, 2015).

2.3 Societal Barriers and Attitudes Towards Disability

In addition to healthcare, other barriers exist for individuals with disability, including in accessing employment and education (WHO, 2011). In 2009, the UK ratified 'the United Nations Convention on the Rights of Persons with Disabilities,' which outlined how those with disabilities should be afforded the same human rights and equity to others in society, whilst recognising that poor public awareness, stigma and discrimination are barriers to achieving this (Staniland, 2009). Forming part of the British Attitude Survey (BAS), the government's Office of Disability Issues included items to explore public perceptions and attitudes towards those with disability, along with a recognition that lack of understanding and negative attitudes can result in negative public behaviours towards individuals with disabilities, acting as barriers to achieving an equitable society (Staniland, 2009). Perceptions of disability were measured along five broad themes (e.g., perceptions of prejudice those with disability face, perceptions of the abilities of a person with disability), and members of the public were asked about their attitudes towards those with different disabilities (e.g., physical disability, mental health condition). 38% of respondents considered that people with disabilities were less productive than those without disability, and members of the public also reported feeling more comfortable interacting with a person with a physical disability (91%-98%) in a variety of social contexts (e.g., move next door to someone, the person is their MP or boss) than someone with a mental health condition (39%-79%; Staniland, 2009).

Thus, the nature of disability (e.g., whether it is a physical or mental health condition) and its social context, are important factors in determining public attitudes towards, and willingness to interact with, those with a disability. Thus, to achieve the United Nations standards, improved public awareness and understanding is needed more generally (Hendry et al., 2022), including how those with invisible disabilities are perceived in society.

2.4 Invisible and Visible Disability

Disabilities can be visible or invisible to observers. Visible disabilities have an observable physical marker to signify the presence of a disability, whereas invisible disabilities commonly refer to a range of 'hidden' symptoms which can include fatigue, physical pain, dizziness, and mental ill health (Hendry et al., 2022). Invisible disability (i.e., whereby no physical marker of disability exists) accounts for a higher proportion of all disabilities than visible disabilities (Fleischer & Zames, 2012), yet research has predominantly focussed on visible disability, leaving those with invisible disability underrepresented in research. It is commonly believed that those living with visible disabilities are more likely to have experienced negative stigma and discrimination but is less likely to occur when disabilities are invisible or when a person may deliberately conceal the presence of a disability to avoid negative social reactions (Ysasi et al., 2018). However, those with invisible disabilities are more likely to report feeling misunderstood and have others doubt the impact and seriousness of their disability (Hendry et al., 2022; Ysasi et al., 2018). Indeed, Hendry et al. (2022) conducted a qualitative study exploring the experiences of 18 individuals living with a range of (undisclosed) invisible disabilities, finding that lack of visibility of their disability affected how they were viewed by others, which meant that their disability was often ignored or under recognised. For example, one participant even reported using a walking stick to provide a visible marker to others in order to indicate the presence of a disability (Hendry et al., 2022). Comparable findings have also been reported elsewhere (e.g., Davis, 2005; Olkin et al., 2019; Swift & Wilson, 2001). For instance, Olkin et al. (2019) found that women reported having experienced frequent microaggressions (e.g., verbal, or non-verbal subtle behaviours which are harmful towards the individual) from others about their invisible disability, which included denying or minimising their effects and, in some instances, suggestions that symptoms were being faked to gain from the 'system' in some way.

Whilst the social experiences of those living with visible and invisible disabilities may be different, those with invisible disabilities report negative social experiences and may also face barriers to accessing education and employment (Hendry et al., 2022; Olkin et al., 2019; WHO, 2011). In addressing such barriers, it is paramount to consider public knowledge, understanding and attitudes of invisible disability, in order to identify gaps in knowledge and negative attitudes which could be tackled through public awareness campaigns and education (WHO, 2011). Furthermore, whilst experiencing an invisible disability can result in shared experiences of feeling misunderstood (e.g., Hendry et al., 2022), it is also important to consider the specific and potentially unique challenges associated with each disability, including TBI.

2.5 Public Understanding of TBI

Public awareness, knowledge and understanding of TBI is generally poor (Gouvier et al., 1988), with members of the general public often holding significant misconceptions about the physical and psychosocial sequelae of TBI (Hux et al., 2006; Pappadis et al., 2011; Willer et al., 1993). Gouvier et al. (1988) found that 46% of 221 community participants believed that a second blow to the head could reduce amnesia and restore lost memories, and Hux et al. (2006) reported that 93.4% of their general population sample believed that '*a person with a brain injury can have a memory impairment so severe that they cannot recognise family members or remember autobiographical events, but can be normal in every other way.'* Similar misconceptions have also been demonstrated in populations who provide services to those with TBI, including those in the medical, educational, correctional, and healthcare sectors (Hux et al., 1996; Oyesanya et al., 2016; Oyesanya & Snedden, 2018; Yuhasz, 2013). Swift and Wilson (2001) found that medical professionals without specialist brain injury knowledge held numerous misconceptions around the complexity of the recovery process. Similarly, Linden et al. (2013) found that 74% of their sample of educational professionals did not know or incorrectly agreed with the statement '*children who are knocked unconscious wake up quickly with no lasting effects*', and Yuhasz (2013) found an overall TBI misconception rate of 24% (ranging from 0%-73% for individual items) in a sample of health professionals working in a correctional setting.

Various factors have been linked to knowledge, expectations, and beliefs about TBI, including both demographic (e.g., age, gender) and experiential factors (e.g., level of education, occupation), as well as passive (e.g., via information in the media) and active (e.g., direct exposure to TBI) information (Block et al., 2016; Ernst et al., 2009; Hux et al., 2006). Surprisingly, however, personal exposure to TBI has been inconsistently related to accuracy of TBI knowledge (Gouvier et al., 1988; Guilmette & Paglia, 2004; Yuhasz, 2013). Even when people report receiving information from health professionals, knowledge of TBI recovery and related sequelae is still poor (Gouvier et al., 1988). In contrast, media misinformation has been frequently cited as a source of misconceptions for members of the lay public (e.g., Hux et al., 2006). For instance, the media often inaccurately portray a second injury as curative or use memory loss as a plot device rather than realistically portraying the full breadth of changes that can occur after TBI (Baxendale, 2004; Block et al., 2016).

Understanding misconceptions, awareness, and knowledge of TBI is critical in reducing stigmatisation and subsequent discrimination of survivors with TBI. Moreover, raising awareness of the hidden and often invisible nature of TBI is pivotal for creating accurate and realistic expectations around TBI and the recovery process (McClure, 2011). Indeed, a disconnect often exists between what is expected of a person after TBI once a ‘good’ physical and external recovery has been achieved, and then the daily challenges they actually face (Swift & Wilson, 2001). For instance, returning to the workplace and integrating back into the community can often be a struggle after TBI (Linden et al., 2005; Stergiou-Kita et al., 2017), irrespective of whether there is an accompanying outward manifestation of injury. Tackling such misconceptions requires a multi-level approach in the form of public awareness campaigns and training healthcare, correctional, and educational professionals to recognise the hidden impact of TBI. Working alongside survivors and their families directly is also essential. Rehabilitation programmes can endeavour to understand what misconceptions survivors experience within their communities, and work on strategies for dealing with them to promote more positive outcomes (McClure, 2011). However, in order to achieve this, appropriate methods of examining misconceptions and awareness of TBI must first be available.

Several scales have been developed to measure misconceptions about TBI, but as will be argued, these scales are often narrow in their focus, failing to capture many relevant domains of knowledge (e.g., injury invisibility, psychosocial outcomes). Furthermore, scales are inconsistently administered across studies, and have rarely been subjected to thorough psychometric evaluation (Block et al., 2016). Through reviewing the comprehensiveness and psychometric properties of existing scales, the need to develop a valid and comprehensive tool for the measurement of TBI misconceptions will be highlighted. Of course, it is not claimed that the scales reviewed here comprise an exhaustive compendium of all available measures. Rather, the focus will be on the scales that are in widespread use, rendering them worthy of review. A brief description of each of these scales is presented followed by a critical review of their construction, psychometric properties, and use in research.

2.6 Review of Existing Scales - Perceptions and Misconceptions of TBI

Here, existing scales are briefly described, including information about their development, format, structure, content, and application in research.

2.6.1 The Common Misconceptions about Head Injury and Recovery Survey

Gouvier et al. (1988) developed a 25-item survey to capture the types of misconceptions family members commonly hold about TBI when their loved ones commence rehabilitation. Rated on a 4-point Likert scale of ‘true,’ ‘probably true’ ‘probably false’ and ‘false’, items cover five core domains: (1) ‘use of seat belts’ (e.g., *‘Wearing seatbelts causes as many injuries as it prevents’*); (2) ‘nature of unconsciousness’ (e.g., *‘When people are knocked unconscious, most wake up shortly with no lasting effects’*); (3) ‘amnesia’ (e.g., ‘*People can forget who they are and not recognize others, but be normal in every other way’*); (4) ‘characteristics associated with brain injury’ (e.g., *‘Emotional problems after head injury are usually not related to brain damage’*), and (5) ‘recovery from brain injury’ (e.g., *‘Once a recovering person feels “back to normal” the recovery process is complete’*).

Originally completed by 221 members of the public in a US shopping centre, misconceptions were found across each item and domain (misconception endorsements ranged from 11.31% - 82.35%), with at least half of respondents endorsing misconceptions in both the ‘Amnesia’ and ‘Recovery’ domains. For instance, 82.35% and 73.76% of respondents endorsed the statements ‘*People can forget who they are and not recognize others, but be normal in every other way’* and *‘People who have had one head injury are more likely to have a second one,’* respectively.

Since its initial development, the Gouvier et al. (1988) survey has formed the basis of several subsequent scales (see Table 2.1). For instance, Willer et al. (1993) utilised nine items to investigate misconception rates in 313 members of the public from different regions across the USA, whilst Guilmette and Paglia (2004) used 11 of the original items, plus eight new, forensically orientated items to explore misconception rates in an urban setting. Overall, misconceptions rates were similar across the three studies, although Guilmette and Paglia (2004) found a lower misconception rate for two concussion items.

Table 2.1

25-item Gouvier et al. (1988) Survey and Item use in Subsequent Scales.

Item	Surveys using individual items from the scale	Items adopted for new scale development
Domain: Seatbelts		
1. Wearing seatbelts causes as many injuries as it prevents.		CM-TBI (Springer et al., 1997))
2. It is safer to be trapped inside a wreck than to be thrown clear.		CM-TBI (Springer et al., 1997)
3. You don't need seatbelts as long as you can brace yourself before a crash.		CM-TBI (Springer et al., 1997)
4. It is more important to use seatbelts on long trips than in driving around town.		CM-TBI (Springer et al., 1997)
Domain: Brain Damage		
5. A head injury can cause brain damage even if the person is not knocked out.	(Guilmette & Paglia, 2004)	BIMS (Hux et al., 2006)
6. Problem with speech, coordination, or walking are usually due to brain damage.		CM-TBI (Springer et al., 1997)
7. Whiplash injuries to the neck can cause brain damage even if there is no direct blow to the head.	(Guilmette & Paglia, 2004)	BIMS (Hux et al., 2006)
8. Most people with brain damage are not fully aware of its effect on their behavior.		CM-TBI (Springer et al., 1997)
9. A little brain damage doesn't matter much, since people only use a part of their brains anyway.	(Guilmette & Paglia, 2004; Willer et al., 1993)	CM-TBI (Springer et al., 1997)
10. Emotional problems after head injury are usually not related to brain damage.		BIMS (Hux et al., 2006)
11. Most people with brain damage look and act retarded.		BIMS (Hux et al., 2006)[a]
Domain: Unconscious		
12. When people are knocked unconscious, most wake up shortly with no lasting effects.		BIMS (Hux et al., 2006)

13. Even after several weeks in a coma, when people wake up, most recognize and speak to others right away.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMSCM-TBI (Springer et al., 1997)
14. People in a coma are usually not aware of what is happening around them.		BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)
Domain: Amnesia		
15. After a head injury, people can forget who they are and not recognize others, but be normal in every other way.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)
16. Sometimes a second blow to the head can help a person remember things that were forgotten.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006) [a], CM-TBI (Springer et al., 1997))
17. People with amnesia for events before the injury usually have trouble learning new things too.		BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)
18. People usually have more trouble remembering things that happen after an injury than remembering things from before.	(Guilmette & Paglia, 2004[a]; Willer et al., 1993[b])	BIMS (Hux et al., 2006) [a], CM-TBI (Springer et al., 1997)
Domain: Recovery		
19. How quickly a person recovers depends mainly on how hard they work at recovering.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)
20. People who have had one head injury are more likely to have a second one.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997))
21. A person who has recovered from a head injury is less able to withstand a second blow to the head.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)
22. Once a recovering person feels "back to normal," the recovery process is complete.		BIMS (Hux et al., 2006)
23. It is good advice to rest and remain inactive during recovery.		BIMS (Hux et al., 2006)
24. "No pain-no gain" is good advice for a recovering patient.		
25. Complete recovery from a severe head injury is not possible, no matter how badly the person wants to recover.	(Guilmette & Paglia, 2004; Willer et al., 1993)	BIMS (Hux et al., 2006), CM-TBI (Springer et al., 1997)

[a]wording alteration from original item [b]replicated wording alteration provided by Willer et al. (1993)

2.6.2 Brain Injury Misconception Scale (BIMS)

To examine the impact of public health awareness campaigns and to explore changes in misconception rates over time, Hux et al. (2006) selected 17 items which had shown misconception rates of at least 25% from Gouvier et al.'s (1988) and Willer et al.'s (1993) research. Collectively, these items formed the Brain Injury Misconception Scale (BIMS) (Hux et al., 2006). Hux et al (2006) altered the wording of some items to improve comprehension and to reflect changes in language acceptability (e.g., the word 'retarded' was replaced with 'disabled'). Using a two- point, true/false response format, four domains were captured: (1) general knowledge (e.g. *'Emotional problems after head injury are usually not related to brain damage'*); (2) coma and unconsciousness (e.g. *'When people are knocked unconscious, most wake up shortly with no lasting effects'*); (3) memory deficits (e.g. *'People with amnesia for events before the injury usually have trouble learning new things too'*), and (4) recovery (e.g. *'It is good advice to remain inactive during recovery'*). Hux et al. (2006) reported lower misconception rates than both Gouvier et al. (1988) and Willer et al. (1993) in the general knowledge domain, potentially attributable to improved knowledge following public awareness campaigns. However, significant misconceptions remained in the coma, memory deficits and recovery domains.

Chapman and Hudson (2010) also found evidence of misconceptions on the BIMS in a UK sample of 332 people. Compared to Hux et al. (2006) and their USA sample, UK respondents reported significantly more misconceptions in the general knowledge, memory deficits, and coma domains. However, given the different sampling strategies adopted across studies (i.e., face-to-face survey versus snowball strategy via email, post, or in-person) it is difficult to draw firm conclusions about these differences.

2.6.3 Common Misconceptions of Traumatic Brain Injury (CM-TBI)

Consisting of 40 items (24 adapted from Gouvier et al., 1988) rated on a four-point response format (true, probably true, probably false, or false), the CM-TBI (Springer et al., 1997) covers: (1) 'seatbelts/prevention'; (2) 'brain damage'; (3) 'unconsciousness'; (4) 'amnesia'; (5) 'recovery'; (6) 'rehabilitation', and (7) 'brain injury sequelae'. Items were generated through clinical experience of observing the information, knowledge, and misperceptions that family and survivors hold in relation to brain injury. When administered to 51 family members of survivors of TBI at their point of entry into inpatient rehabilitation services (Springer et al., 1997), an overall misconception rate of 23.1% was reported. Misconceptions were particularly evident in the amnesia, recovery, and unconsciousness domains.

McKinley and Buck (2018) adapted the CM-TBI to assess educators' knowledge of brain injury by excluding items measuring concussion knowledge, choosing instead to use an adapted 20-item concussion awareness questionnaire (McKinlay et al., 2011). Similarly, Farmer and Johnson-Gerard (1997) slightly modified the wording of the original 40-item CM-TBI (e.g., substituting 'people/person' to 'child/children'), to assess educators' (n=184) versus rehabilitation specialists (n=111) knowledge of childhood TBI. Across both studies, comparable misconception rates were seen in half of the common survey items, although McKinlay and Buck (2018) found fewer misconceptions on 37% of the items particularly in relation to recovery, and higher misconception rates on 17% of items, with some measuring emotional changes after brain injury.

2.6.4 Head Injury Knowledge Scale (HIKS)

The HIKS (Ono et al., 2011) attempts to capture how individuals may simultaneously fail to recognise common outcomes (e.g., *'have trouble remembering details of recent conversations'*; minimisation) and overgeneralise by endorsing outcomes that are not commonly associated with TBI (e.g., *'become upset and yell for no reason'*). A true response in the 'overgeneralisation' and a false response in the 'minimisation' domains indicate the presence of a misconception. During its development, 13 individuals with TBI, screened for a good level of self-awareness and insight, completed the scale. Only items that were widely agreed upon were retained. 101 participants without TBI then completed the HIKS and BIMS; the latter was included so that the convergent validity of the HIKS could be examined. However, the internal consistency of the BIMS was found to be extremely low (α =.14), undermining its credibility as a suitable tool for validating the HIKS. Even so, misconceptions rates for individual items ranged from 11.11% - 57.58%, with participants more likely to overgeneralise than minimise the effects of TBI. However, females overgeneralised more than males, and participants with direct experience of TBI tended to overgeneralise less than those with indirect/limited experience.

2.6.5 Brain Injury and Schizophrenia Awareness Scale (BISAS)

The BISAS (McKendry et al., 2014) aims to capture public understanding of the distinct and common functional outcomes of schizophrenia and brain injury Consisting of 31-items in total, 12 items relate to the shared outcomes of brain injury and schizophrenia (e.g. *'have a poor understanding of the effects of their condition'*, nine to the common and distinct outcomes of TBI (e.g. *'Have difficulty scanning the environment to find an object they are looking for'*), six to the common and distinct outcomes of schizophrenia (e.g. *'Believe they are highly influential and have special gifts'*), and four items which are generally unrelated to either (e.g. *'Consistently complete tasks from start to finish'*). A 4-point response scale allows respondents to indicate if they believe items are common to TBI *or* schizophrenia, are common to *both*, or are 'rarely experienced' in either condition. Participants (n=175, lay sample) were generally more accurate in identifying the distinct effects of TBI and schizophrenia rather than their shared impacts – though this pattern was not found in a professional sample made up of 40 individuals working in the field of mental health or for disability services. Overall, behavioural, and emotional consequences were more likely to be attributed to schizophrenia and conversely, cognitive deficits were perceived as more common after TBI in the lay sample.

2.6.6 Rosenbaum Concussion Knowledge and Attitudes Survey (RoCKAST-ST)

Scales have also been developed for use in specific contexts, such as the College Football Head Injury Survey (Sefton, 2003) and the Knowledge and Attitudes about Sports Concussion Questionnaire (Simonds, 2004). However, such measures have been heavily criticised for lacking psychometric integrity and for focusing on return to play without assessing wider perceptions of head injury (Rosenbaum & Arnett, 2009). To address such limitations, Rosenbaum and Arnett (2009) developed the RoCKAST-ST, a 55-item scale assessing knowledge of the causes and consequences of concussion, as well as attitudes towards 'return to play.' Items were drawn from a mixture of sources (e.g., Gouvier et al., 1988), and two composite scores can be calculated - a 'Concussion Knowledge Index' (CKI - score range 0-25) and a 'Concussion Attitudes Index' (CAI - score range 15-75). The RoCKAST-ST has been used to survey 26 professional Champions League players in England (J. M. Williams et al., 2016), with findings highlighting how favourable attitudes towards safe play and/or good concussion knowledge do not necessarily translate into commitments towards safer behaviours on the pitch.

2.6.7 Surveys Developed for Professional Contexts

Surveys have also been developed to assess knowledge and perceptions of educators, who may, within their role, work alongside individuals with TBI. Hux et al. (1996) developed a 65-item survey specifically designed for Speech and Language Pathologists, focusing on their perceived ability to facilitate the assessment, intervention, and reintegration of children back into a classroom setting post-TBI. Covering legislative knowledge, TBI outcomes and training received, items are rated on a combination of yes/no and 5-point Likert response formats. Similarly, the 'Perceptions of Brain Injury Survey' (PBIS) assesses nurses' beliefs and knowledge of TBI within their professional context, as well as how they would seek information to inform their practice (Oyesanya et al., 2016). The PBIS was developed by adapting some items from Hux et al. (1996) and contains three sections: (1) 20 items, scaled from 1 (none) to 4 (expert) on knowledge around care planning and clinical guidelines; (2) 17 items scaled from 1 (strongly agree) to 4 (strongly disagree) focusing on understanding of prognosis, perceived consequences, nursing role, and role of knowledge in practice, and (3) a categorical 'tick all that apply' question concerning how a nurse might seek information to improve their practice (e.g., ask a more experienced colleague). The survey was emailed to all registered nurses in hospital departments within a regional healthcare system, with 330 online responses captured from paediatric nurses (Oyesanya et al., 2016). Paediatric nurses frequently endorsed inaccurate beliefs directly related to TBI care, such as the perceived usefulness of TBI injury classification (i.e., mild, moderate, or severe) to inform care planning in the absence of other information about the patient. In turn, such beliefs could negatively impact on care provision and compromise the accuracy of information relayed to families about recovery (Oyesanya et al., 2016).

2.7 Evaluation of Existing Scales

To determine whether there is need to develop a more valid and comprehensive tool for the measurement of TBI knowledge and misconceptions, it is important to consider how items for the most commonly used scales described above were generated, what processes were applied to the resultant scales to ensure reliability and validity (see Table 2.2), and how survey responses have been scored and presented in research. By applying these evaluations systematically to the scales, and walking through the process of scale development, areas for improvement can be identified.

Table 2.2

Overview of TBI Measures and Evaluation of their Psychometric Properties

Scale name	Number of items and item coverage	Domains	Development and item generation	Scoring system	Psychometrics
Gouvier et al. (1988)	25 items - knowledge and perceptions of TBI	Use of seat belts, nature of unconsciousness, amnesia, characteristics associated with brain injury, recovery	Clinical based observations	4-point scale (True, Probably True, Probably False, False)	None
BIMS (Hux et al., 2006)	17-items - knowledge and perceptions of TBI	General knowledge, coma and unconsciousness, memory deficits, recovery	Items selected from Gouvier et al. (1988) survey using criteria of at least 25% misconception rate in original research	2-point scale (True/False)	None in original study Cronbach's α= .14 (Ono et al., 2011)
CM-TBI (Springer et al., 1997)	40-items - knowledge and perceptions of TBI	Seatbelts/ prevention, brain damage, unconsciousness, amnesia, recovery, rehabilitation, brain injury sequelae	Clinical based observations and adapted items from Gouvier et al. (1988)	4-point scale (True, Probably True, Probably False, False)	None in original study Cronbach's alpha α =.75 -.84 Factor analysis revealed 20-item 4 factor structure
HIKS (Ono et al., 2011; Thomas & Jobse, 2015)	15-items - physical, sensory, perceptual, cognitive, and behavioural consequences of TBI	Overgeneralisation and minimisation	Used functional consequences of TBI to generate the likely and unlikely effects of TBI	2-point scale (True/False) but subsequently extended to a 4-point scale (43)	Cronbach's overall α=.31 (initial study) and overgeneralisation α = .65 - .84 and minimisation α = .68 - .81 CFA confirmed proposed 2-factor structure
BISAS (McKendry et al., 2014)	31-items - knowledge and perceptions of TBI and Schizophrenia, as well as symptoms unrelated to either	Symptoms of TBI and Schizophrenia	Reviewed TBI outcomes and symptoms of Schizophrenia and used an expert group to determine items for inclusion	4-point scale (items common to TBI / Schizophrenia, items common to both, or 'rarely experienced')	Discriminant and convergent validity measured. Construct validity measured with professional sample
RoCKAS_ST (Rosenbaum & Arnett, 2009)	55-items - knowledge of concussion and attitudes around 'return to play'	Concussion Knowledge Index (CKI) and Concussion Attitudes Index (CAI)	Development from other sport's focussed measures and modified concussion items from Gouvier et al. (1988)	2 (True/False) and 5-point (Strongly Agree – Strongly Disagree) scales	Test-retest reliability ICC = .79 Construct validity evaluated EFA revealed 4-factor solution for CAI and cluster

					analysis revealed 3-cluster solution for CKI Cronbach's α = .59- .72 for sub-domains
Hux et al. (1996)	65 items - legislative knowledge, TBI outcomes and training received for managing TBI	Federal legislation, procedures relating to assessment and treatment of TBI, knowledge of TBI	Developed the survey and distributed to 10 speech and language pathologists for review	2 (True/False) and 5-point (Strongly Agree – Strongly Disagree) scales	None
PBIS (Oyesanya et al., 2016)	37 items - knowledge and beliefs about TBI, as well as a section on learning styles	Perceived knowledge, beliefs and learning preferences	Further developed Hux et al. (1996) and survey on knowledge and learning preferences for nurses caring for TBI survivors. Professional feedback sought from nurses and TBI experts	4-point scales (None, Some, Moderate, Expert, or Strongly Agree - Strongly Disagree). Learning styles - tick box to indicate preference	Authors note that measure has been psychometrically evaluated

2.7.1 Item Development

To a greater or lesser extent, several existing scales included or adapted items from Gouvier et al. (1988). However, even though these items were originally derived from knowledge-based misconceptions evident in family members of individuals with TBI, suggesting good validity, such a bottom-up approach to item generation could equally have constrained the breadth of item coverage. Expanding on this approach, Springer et al. (1997) drew on clinical experience when generating additional items for the CM-TBI, thereby improving the content and face validity of the scale. However, such approaches to item generation ultimately lack reference to an overarching theoretical or conceptual framework, increasing the risk that important items/domains are excluded.

In contrast, the HIKS and BISAS both used functional outcomes, focusing on the physical, behavioural, sensory, and cognitive impairments associated with TBI as underlying knowledge constructs to establish scale items (e.g., Ono et al., 2011). However, whilst such an approach uses an overarching framework for item generation, the focus on symptoms and dysfunction within the individual conforms to a more medicalised view of brain injury, thus narrowing item coverage. Consequently, when compared to the CM-TBI with its broader coverage (i.e., impairment, psychological impact, rehabilitation, and recovery), the HIKS and BISAS arguably lack relevance and applicability to applied research. What is apparent is the need to move towards a more holistic assessment of perceptions of TBI which incorporates a broad range of domains (e.g., social recovery and risk factors). Key to this is the need to model item generation on a clear conceptual- theoretical framework which moves beyond a medical model (WHO, 2002).

2.7.2 Content Validity

Central to scale development is the need to consider the extent to which items represent all facets of a given construct and have discriminatory value. However, few existing scales have addressed content validity as part of the development process. For those that have (e.g., Ono et al., 2011), pilot testing has enabled refinement of measures prior to testing in larger samples, identifying items for removal which lack any discriminatory value and/or are ambiguous in their meaning. For example, the HIKS was initially validated in a small sample of individuals with brain injury (n=13) to ensure items mapped across to the real-world consequences of TBI. This information was then used to exclude items with an endorsement rate below 60%, resulting in the removal of two items. However, using this endorsement threshold could still have resulted in the inclusion of items attracting inconsistent and/or variable responses. Other scales have tested items with brain injury professionals, asking small samples to check items for accuracy and possible ambiguity (e.g., Rosenbaum & Arnett, 2009; Willer et al., 1993). However, existing measures tend to rely on a single approach, even though the adoption of multiple different approaches (e.g., drawing from the outcomes literature and phenomenological experiences of those with TBI and their carers in addition to the aforementioned methods) would facilitate better content validity.

2.7.3 Construct Validity

Less extensively investigated, examination of construct validity has typically involved collecting data from a professional sample for comparison against a lay population (e.g., Farmer & Johnson-Gerard, 1997), an approach which is useful for detecting key areas where perceptions are most inaccurate in lay populations. For example, the BISAS compared responses from an expert (e.g., disability and mental health workers) versus non-expert community sample (McKendry et al., 2014). An additional method for establishing construct validity is to scrutinise items for socially biased responding (King & Bruner, 2000). For instance, Rosenbaum and Arnott (2009) found that scores on the RoCKAST-ST did not significantly correlate with the Social Desirability Scale (SDS: Crowne & Marlowe, 1960). In sum, future scale development should focus more on systematically evaluating construct validity and should aim to use multiple methods.

2.7.4 Response Formats

There are inherent problems with how existing tools have been scaled. First, most tools have utilised 2- or 4- point true/false scales (e.g., CM-TBI, BIMS), commonly dichotomising responses for analysis (e.g., Gouvier et al., 1988; Pappadis et al., 2011). For example, re-scoring uncertain responding (e.g., 'possibly true' or 'possibly false' responses) captured on 4 –point scales as either 'true' or 'false'. Second, even though capturing a lack of knowledge is as beneficial as uncovering inaccurate perceptions, few existing scales include a mid-point option for participants to indicate that they do not know the correct response. Linden et al., (2013) found that participants frequently used the 'don't know' response on the CM- TBI. In over half of the 40 items measured, a notable proportion (at least 30%) of the sample responded with uncertainty, with 70% of respondents making use of the 'don't know' option on one specific item *('Drinking alcohol usually affects a young person differently after a brain* *injury'*). Likewise, even though the RoCKAST-ST included a 'neutral' mid-point for items examining attitudes to safe play, the knowledge index utilises a true/false response format (Rosenbaum & Arnett, 2009). These findings highlight the caveats that need to be considered when interpreting findings from misconception surveys. How data from survey responses have been treated before analysis, and whether any neutral midpoints have been included in the scales, warrants attention before definitive conclusions are made regarding misconception rates.

2.7.5 Research Designs and Analysis of Findings

Reporting of misconception rates have tended to be descriptive, focussing on frequency counts in order to draw comparisons across research studies (e.g., Chapman & Hudson, 2010; Hux et al., 2006). Advancements in this area should move towards more robust research designs which allow for measurement between different groups (Block et al., 2016), such as different levels of exposure and experience of TBI and their relationship to knowledge. Block et al. (2016) also advocates for the inclusion of effect sizes to improve comparisons across studies. Devising tools which can be scaled to produce overall scale scores and individual domains scores would also facilitate this process, allowing for a more reliable assessment of knowledge without being susceptible to possible idiosyncrasies of individual items. In line with this recommendation, more recently developed measures, including the HIKS and RoCKAST-ST, have done this. However, these scales are used fairly infrequently in misconception research even though attempts to scale more established measures have been largely unsuccessful. For instance, Linden et al.

(2013) found that only 20 of the original 40 items from the CM-TBI loaded onto factors to produce a unified scale with four subscales.

2.7.6 Other Psychometric Considerations

Researchers who have imported items from existing scales have tended to use them without reporting or investigating their reliability and validity (Guilmette & Paglia, 2004; Hux et al., 2006). Indeed, it was only through the focused development of a new measure, namely the HIKS, that the internal consistency of the BIMS (based in part on Gouvier et al., 1988 survey) was evaluated and found to be extremely low – $\alpha = .14$ (Ono et al., 2011). In contrast, the CM-TBI which is widely used in applied settings (Linden et al., 2013; O'Rourke et al., 2018a) has been shown to have good levels of internal consistency ranging from $\alpha = .75 - .85$ (de Iorio et al., 2017; Linden et al., 2013; Pappadis et al., 2011). The later revised 20 item CM-TBI also evidenced good levels ($\alpha = .77 - .84$) of internal consistency (Linden et al., 2013; O'Rourke et al., 2018a) but was more varied across the four subscales: Recovery (8 items) - $\alpha = .73$; Sequelae (6 items) - $\alpha = .81$; Insight (3 items) - $\alpha = .61$, and Hidden Injury (3 items) - $\alpha = .55$ (O'Rourke et al., 2018a).

A key issue is that many existing measures have been retrospectively scrutinised in applied research, rather than at the point of development. Additionally, some measures that use items from the BIMS and CM-TBI have presented their results alongside previous research for comparison (e.g., Hux et al., 2006), yet no reliability testing over time has been carried out (e.g., test-retest reliability). Consequently, fluctuations in misconception rates across studies could simply reflect issues with scale reliability rather than indicating contextual or real-world differences over time. Indeed, the RoCKAST-ST is the only existing measure where test-retest reliability has been examined, with the CKI showing good consistency in responses (ICC = .79) but with the CAI (Concussion Attitudes Index) falling below acceptable levels (ICC = .67; Rosenbaum & Arnett, 2009). However, the test-retest interval was only two days, raising the possibility that participants would have been able to recall their responses from the previous session and respond in line with their recollections (Multon, 2012).

To address some of these issues, the HIKS was psychometrically evaluated during its initial development phase (Ono et al., 2011). However, in the initial pilot, internal consistency of the overall measure was found to be extremely low (α = .31) even though the overgeneralisation and minimisation subscales evidenced acceptable levels of internal consistency (α = .65 and α = .68, respectively). A negative correlation was also found between the two subscales, giving weight to the claim that they represent two opposing dimensions (Ono et al., 2011). In its original format, a true-false response format was adopted; however, to carry out confirmatory factor analysis (CFA) and improve levels of internal consistency, a 4-point scale was subsequently adopted (Thomas & Jobse, 2015). Notably, the Cronbach's alpha values for the two subscales improved: overgeneralisation - α = .84, and minimisation - α = .81. CFA also demonstrated a good fit to the original two- dimensional model developed by Ono et al. (2011), although a moderate co-variance was found between the factors.

Equally, even though the RoCKAST (Rosenbaum & Arnett, 2009) adopted a more thorough approach to scale development, its focus on sports related concussion and attitudes in a sporting context limits its applicability to general population studies. This is also an issue with other scales that have been developed for targeted populations (e.g., PBIS; Oyesanya et al., 2016). Finally, scales developed to survey non-expert professionals in early research have not focused on evaluating reliability and validity (e.g., Hux et al., 1996), but later research on the PBIS for example, has referred to the scale as having good psychometric properties (Oyesanya et al., 2016).

2.8 Future directions and recommendations

From reviewing existing measures pertaining to assess misconceptions and perceptions of TBI, it is apparent that an ideal instrument has yet to be developed. However, given the complexities involved with measuring perceptions and knowledge of TBI, it may be an unreasonable expectation that any single measure will be entirely sufficient. Although, that is not to say that a better, more reliable, valid, and conceptually driven measure should not be developed. When approaching this task, consideration of the following recommendations would be beneficial.

First, it is recommended that the constructs assessed by existing knowledge- based measures are revisited. Existing items generated to assess the knowledge construct of TBI have mostly been drawn through clinical experience of misconceptions or by using the functional consequences of brain injury as a starting point. However, such approaches are limited by their lack of overarching conceptual framework, with some important areas neglected as a result. For example, the CM- TBI and HIKS (Ono et al., 2011; Springer et al., 1997) predominantly cover the cognitive and emotional consequences of brain injury, neglecting to incorporate items related to social recovery. Further, even though there is undoubtedly some commonality across measures (i.e., inferred from common domains, importation of items from existing scales), there is equally large variation, suggesting that researchers do not have a homogeneous view of what they are trying to assess. Instead, a more conceptually driven approach to item generation may enable the development of a more holistic and consistent assessment of perceptions relating to brain injury. One possibility is to adopt the bio-psychosocial framework captured by the revised International Classification of Impairments Diseases and Handicaps (ICIDH-2; WHO, 2002), a method commonly used for classifying and understanding the functional and social disadvantage associated with brain injury. Adoption of this framework would capture the multiple layers of disability arising from brain injury, including impairments (e.g., memory loss), activities (e.g., motor, communication problems) and participation/social handicap (e.g., community and working life), as well as an assessment of environmental factors (e.g., social attitudes towards people with TBI).

Second, a new measure would benefit from Likert scaling (e.g., 5-7 response formats) with inclusion of a neutral midpoint response option to allow discrimination between a lack of knowledge of TBI and a misconception. Third, newly developed scales should be subjected to more thorough psychometric evaluation. In addition to internal consistency, other properties of reliability need to be routinely investigated (e.g., test-re-test) and information about construct and content validity should be determined. Likewise, measures should be subjected to robust statistical analysis to identify overall scale and subscale structures during the development phase. Importantly, this would increase the measures' subsequent utility in applied research by reducing the risk of individual item idiosyncrasies and fluctuations, and by allowing direct comparison of misconception rates between populations (e.g., lay versus professional samples) and across time.

Fourth, it is also important to consider the broad spectrum of knowledge and attitudes that the public hold about individuals with TBI. Focused attempts to develop measures specific to TBI have, to date, been constrained to measuring knowledge of TBI and do not endeavour to measure social attitudes towards individuals with TBI concurrently. The development of such measures has potential to facilitate and improve our understanding of public perceptions, by placing the individual within their social context; something which is critical for understanding and empathising with how individuals' with TBI navigate their social experiences (see Swift & Wilson, 2001). Drawing inspiration from the Positive and Negative Affect Scale (PANAS; Watson et al., 1988), Linden and Crothers (2006) asked both a public and student sample to rate their level of agreement to a 20-item measure of positive and negative attributes (e.g., *'People with brain injuries can be… violent/confident'*). Whilst there were core differences between the groups in how they perceived individuals with brain injury, both groups held some negative views (Linden & Crothers, 2006). However, no psychometric evaluation was carried out of these 20 items during the research. Other research evaluating attitudes to brain injury has found that nurses hold more prejudicial attitudes towards survivors when they are presented as being to blame for their brain injury (i.e., resulting from taking drugs) compared to being presented as blameless (i.e., resulting from an aneurysm) (Linden & Redpath, 2011). Similarly, prejudicial attitudes and less desire for social interaction has also been reported in lay samples when survivors are deemed responsible for their brain injury (Linden et al., 2007; Redpath & Linden, 2004). However, the two scales adopted to explore attitudes in these studies (Prejudice Evaluation Scale, PES – and Social Interaction Scale – SIS: Kelly et al., 1987) were devised specifically for evaluating attitudes towards AIDS. These measures were presented alongside scenarios and included items of little relevance to brain injury (e.g., PES Item – '*Would you attend a party where X was preparing dinner?*'). Given these findings, developing new tools specifically designed to explore attitudes in the context of brain injury is equally as important.

2.9 Conclusion

This Chapter has attempted to clarify the core issues that relate to the measurement of knowledge and misconceptions of brain injury, concluding that existing scales are limited by their scope and breadth of coverage, failure to use a conceptual framework, and by their lack of psychometric evaluation. Important to this discussion is how the invisible nature of many TBI sequelae is an underlying factor in public misperception (McClure, 2011). Indeed, observers often expect a physical marker for brain injury, and in the absence of one, will misattribute behaviour and actions to other causes (McClure et al., 2006). Owing to this, those living with TBI often feel that their disability is underestimated and/or trivialised (Swift & Wilson, 2001). With no outward physical marker, and hidden cognitive difficulties underestimated, more is often expected of those with TBI socially. In essence, looking normal on the outside means being viewed as functioning 'normally' on the inside (Swift & Wilson, 2001). These misattributions are considered a potential driving force for negative societal consequences often experienced by those with brain injury (Block et al., 2016; Linden & Boylan, 2010; McClure, 2011) and highlights the important role that brain injury knowledge and misconception scales have in improving our understanding public perceptions.

Thus, the aim of the first part of thesis is to develop better, more reliable, valid, and conceptually driven perceptions of brain injury measures to improve our understanding of how those with TBI are currently perceived in society. Furthermore, once a valid and reliable measure has been developed, the intention is to draw from these findings and use them to inform future experimental manipulations in the empirical Chapters of this thesis (see Chapters 6, 7 and 8).

Chapter 2: Key Messages

- As an invisible disability, misconceptions exist around the nature of, and recovery from, brain injury. However, understanding the nature and extent of these misconceptions and how they may differ across populations and time, has been difficult.
- Existing perception and knowledge-based scales are limited by their scope and breadth of coverage, adoption of a medicalised view of TBI, scaling and scoring issues, failure to use a conceptual framework, and by numerous psychometric issues related to reliability and validity.
- Such measures need to capture both knowledge- and attitude-based perceptions of brain injury, as well as extend the breadth of item coverage to provide a more holistic understanding of perceptions of brain injury.

Chapter 3 Development of the 'Perceptions of Brain Injury Measure' (PBIM) and 'Brain Injury Awareness Scale' (BIAS)

3.1 Chapter Overview

Chapter 2 reviewed the misconception literature relating to TBI and critically reviewed the comprehensiveness, psychometric properties and other qualities of existing scales designed to measure awareness, knowledge and understanding of TBI. Overall, existing scales were found to be significantly limited in their scope and psychometric evaluation. To briefly summarise, previous measures (e.g., Gouvier et al., 1988; Hux et al., 2006; Springer et al., 1997) have lacked an overarching conceptual framework, meaning that items have focussed on the types of misconceptions observed in clinical settings (Gouvier et al., 1988) and/or functional outcomes following brain injury (Thomas & Jobse, 2015). They have also tended to be narrow in their scope, failing to pay attention to both knowledge of, and attitudes towards, brain injury (e.g., Linden & Crothers, 2006). Psychometric evaluation of scales has also been inconsistent, and has often followed, rather than preceded, their usage in research and applied contexts (e.g., Linden et al., 2013). Therefore, existing scales fail to appropriately capture the complexity of TBI related disability and its plethora of impacts on survivors. Therefore, the overarching aim of this Chapter was to develop a new perceptions-based measure of brain injury that covered both knowledge and attitude-based perceptions of brain injury by using a biopsychosocial framework (WHO, 2002). Furthermore, a key part of this process focused on assessing the reliability and validity of both the individual items and resultant measure as part of the development process, which is an important component of successful scale development (Boateng et al., 2018;

Morgado et al., 2018).

3.2 Scale Development Methodology

The process of developing new tools to measure latent constructs is not straightforward (Boateng et al., 2018), with robust and rigorous research methodologies needed to ensure tools are both reliable and valid (see Morgado et al., 2018). To achieve this, Boateng et al. (2018) advocates for a three phased approach, including: (1) Item development; (2) Scale development, and (3) Scale evaluation. At each stage, various tests are applied to the item pool and resultant scale, to evaluate the scale's reliability and validity. Such methods seek to create an end scale which is appropriate and useful for the purpose it has been designed. Thus, a phased approach was taken here, and the research presented in this Chapter focuses on the first two phases - item and scale development - with scale evaluation addressed in Chapter 4.

3.3 Phase One: Item Development

3.3.1 Domains, Emerging Themes, and Item Development

To develop an initial pool of items, existing measures pertaining to perceptions of brain injury were reviewed. Two main strands of research inquiry were identified. The first focussed on perceptions and misconceptions commonly held by members of the general population (e.g., Hux et al., 2006; Papadis et al., 2011) or by professionals in specialist settings, such as the educational and healthcare sectors (Hux et al., 1996; Oyesanya & Snedden, 2018), and both tended to use measures developed specifically to measure knowledge-based perceptions of TBI (e.g., Springer et al., 1997). The second focussed on emotional responses and attitudes towards individuals with brain injury (e.g., Linden & Crothers, 2006; Linden et al., 2007), and tended to either use questions which had not been subjected to rigorous psychometric evaluation (e.g., Linden & Crothers, 2006) or adapted measures from other contexts (e.g., Redpath & Linden, 2004). For example, some studies adapted the Prejudicial Evaluation Scale (PES; Kelly et al., 1987) and Social Interaction Scale (SIS; Kelly et al., 1987); which were originally devised to measure perceptions and attitudes towards individuals with AIDS.

To extend current research around perceptions of brain injury, a small team of researchers (EB, CW, RH and AW), some with extensive research experience and/or clinical expertise in TBI, generated an initial pool of potential items using a deductive approach to item development (see Boateng et al., 2018). This approach started by scrutinising existing TBI perception scales for common themes (e.g., Gouvier et al., 1988; Rosenbaum & Arnett, 2010; Springer et al., 1997). However, to fully explore a person's understanding and perceptions of TBI, it was important that the potential pool of items covered the full breadth of TBI related disability. Thus, a 'biopsychosocial' framework was also adopted to ensure that individual items, domains, and themes included coverage of both personal (e.g., how the disability is experienced by the individual) and contextual (e.g., social attitudes or societal factors influencing perceptions, personal factors) factors (WHO, 2002). The biopsychosocial framework is integral to the 'International Classification of Functioning, Disability and Health (ICF; WHO, 2002), where disability is viewed and considered from multiple perspectives. Viewing TBI disability from multiple perspectives was a key driver in item development, with the aim of creating an end scale which could holistically evaluate public perceptions of brain injury. TBI disability can lead to multiple layers of disability, with physical changes to the brain causing *impairments* (e.g., what the core symptoms for individuals with brain injury) which then limit both daily *activities* (e.g., how do impairments caused by brain injury affect the individual) and social *participation* (e.g., social barriers impacted by the individual's symptoms of brain injury). The ICF framework also seeks to understand the relationship between the individual with disability and how this relates to both their personal circumstances and the wider social context. Therefore, developing a tool to explore perceptions pertaining to the context around the individual with TBI disability was also important (WHO, 2002). To do this, perceptions pertaining to *environmental factors,* including social attitudes, were considered during item development.

To address these aforementioned conceptual limitations, the broader TBI misconception literature was examined, including the lived experiences of people with TBI-related disability and of those caring for them (e.g., Swift & Wilson, 2001). It was envisaged that reviewing such literature would facilitate the development of a more holistic and representative item pool which would, in turn, tap into the multiple layers of disability often experienced after TBI. Drawing from such research ensured that item development also encompassed perceptions drawn from the perspectives of those living with, and affected by, TBI-related disability.

Finally, to facilitate coverage of the broader social context, such as perceptions pertaining to social attitudes and/or how individuals are perceived in their wider social context, measures commonly used to explore attitudes towards people with other stigmatising health conditions (e.g., individuals with HIV or mental health difficulties; Kelly et al., 1987; P. Corrigan et al., 2003) were also reviewed.

These initial steps resulted in a pool of items which were inspired by and/or adapted from existing measures, as well as novel ones. For example, '*It is not possible to have a serious brain injury without losing consciousness'* was an item that was developed by drawing inspiration from other scales (e.g., CM-TBI; Springer et al., 1997 - '*A head injury can cause brain damage even if the individual is not knocked unconscious'*). In contrast, novel items tended to explore perceptions that have previously been ignored, such as those exploring the broader consequences of TBI and social changes to the individual. For example, *'Returning to work after brain injury is commonplace'* and *'Many people with brain injury are at an increased risk of homelessness.*'

The steps to item generation identified above yielded an initial pool of 249 items which were initially grouped under one overarching construct pertaining to brain injury perceptions, and two example early themes included 'Acquirement of head injury' and 'Empathy, Prejudice and Stigma.' However, further consideration and refinement of these initial themes led to the identification of two underlying core constructs: (1) knowledge-based perceptions (n = 172), and (2) attitude-based perceptions (n = 77). Therefore, early themes such as 'Acquirement of Head injury' were grouped under the 'knowledge' construct and 'Empathy, Prejudice and Stigma' was grouped under the 'attitude-based' construct.

3.3.2 Phrasing of Items and Response Formats

Integral to the process of item generation is the need for clarity and consistency in phrasing across items (e.g., ‘person’ and ‘people’ were used throughout; see Simms, 2008). Therefore, final phrasing checks involved some small wording alterations to clarify meaning and to reduce ambiguity (see Simms, 2008). Furthermore, it was important that items from both the knowledge (n = 172) and attitude-based (n = 77) item pools could be scored across a consistent response scale. Previous misconception tools (e.g., Gouvier et al., 1988; Springer et al., 1997) have commonly collapsed a 4-point (‘True,’ ‘Probably True,’ ‘Probably False,’ ‘False’) scaled response set to a 2-point ‘True’ versus ‘False’ position for the purposes of data analysis. Thus, responses reflecting certainty (e.g., ‘True’) and uncertainty (e.g., ‘Probably True’) are considered equivalently (e.g., Gouvier et al., 1988). Therefore, an integral part of the development process was to ensure that both knowledge-based and attitude-based perception tools could be scored to reflect a more nuanced and sensitive picture. That is, consideration was paid to the scaling of items, with evidence indicating that a 7- rather than 5-point scale would result in a more reliable, sensitive, and accurate measure (Finstad, 2010; Nunally, 1978). Additionally, Finstad (2010) also found that participants were more likely to interpolate (i.e., insert a response between two scale points) with a 5- rather than 7- point scale, suggesting that the latter is also better at capturing subjective evaluations. Consequently, a 7-point ‘Strongly Agree’ to ‘Strongly Disagree’ Likert scale with a neutral midpoint was adopted (see Likert, 1932) to evaluate attitude- based items. In line with previous knowledge-based scales (e.g., Springer et al., 1997; Hux et al., 2006), a 7-point ‘Definitely True’ to ‘Definitely False’ scale was chosen for knowledge-based items, but again, a neutral mid-point was also included to enable participants to indicate uncertainty.

3.3.3 Knowledge-Based Perception Items

Overall, 172 knowledge-based items were developed, with these going on to form the 'Perception of Brain Injury Measure' (PBIM). These items were mapped across 11 domains, including 'Behavioural control and responsibility,' 'Social consequences of TBI' and 'Understanding changes in the individual' (see Table 3.1). The initial item pool included a mixture of 'true' and 'false' statements. For a false statement (e.g., '*There's not much difference between a brain injury and mental illness*'), a "false" response would be considered correct. For a true statement (e.g., '*Having one brain injury increases the chances of having another'*), a "true" response would be considered correct. Overall, 55% of items were considered by the research team to be true, and 45% were considered to be false.

In addition to the 172 knowledge-based items, a pool of distractor items was also generated to encompass symptoms that were characteristic of a range of other conditions that are unrelated to, and distinct from, brain injury (e.g., schizophrenia, dermatitis). The purpose of these items was to evaluate if participants could discriminate between symptoms of brain injury and symptoms of other, unrelated health conditions and disabilities. In total, 18 distractor items were generated, which represented a mixture of symptoms common across a range of physical health conditions (e.g., heart conditions, allergies, and asthma), mental health diagnoses (e.g., schizophrenia, eating disorders and obsessive-compulsive disorder), and developmental disabilities (e.g., autism). Examples included '*The risks of allergic reactions occurring increase after brain injury,'* '*Expressing delusional ideas is not normally associated with brain injury,'* and '*Engaging in repetitive movements (e.g., hand flapping, finger twisting, rocking back and forth) is common after brain injury.'*

Out of these items, 17 were worded such that the correct response was ‘false’.

3.3.4 Attitude-Based Perceptions Items

A total of 77 attitude-based items were generated, which were later developed into the Brain Injury Awareness Scale (BIAS). These items were mapped across six domains, including ‘Empathy’ and ‘Social inclusion’ (see Table 3.2). To reduce the likelihood of acquiescence bias, both positively (e.g., ‘*A brain injury is traumatic for the person concerned’*) and negatively worded items (e.g., *‘The misfortune of people with brain injury has no emotional effect on me’*) were developed (47% and 53% respectively; see McCrae at el., 2005; Simms 2008).

Table 3.1

Knowledge Based Domains for the 'Perception of Brain Injury Measure (PBIM)

Domain name	Number of items (N = 172)	Example item
1. Causes of brain injury	10	Penetrating forms of brain injury are more severe than non-penetrating forms
2. Identification of brain injury	24	Evidence of brain injury is always detectable from a brain scan
3. Perceptions of recovery	33	The impact of brain injury is enduring and long-lasting
4. Effects of concussion and unconsciousness	14	The effects of concussion are short-lived
5. Understanding changes in the individual	21	A brain injury can cause a sudden change in a person's personality
6. Social consequences	21	Brain injury affects a person's ability to empathise with the emotional needs of others
7. Brain injury coherence	5	People with brain injury find it difficult to adapt to the consequences (if any) of their brain injury
8. Behavioural control and responsibility	11	People with brain injury lack awareness of the impact of their behaviour on others
9. Risk Factors for / from brain injury	9	many people with brain injury are at an increased risk of homelessness
10. Perceptions of motivation and effort	9	How quickly a person with brain injury recovers does not depend on how committed they are to getting better
11. Understanding changes in mood after brain injury	15	Compared to the general population, rates of depression are no different in people with brain injury

Table 3.2

Attitude Based Domains for the 'Brain Injury Awareness Scale' (BIAS)

Domain name	Number of items (N= 77)	Example item
1. Empathy	14	A brain injury is traumatic for the person concerned
2. Social inclusion	15	If a friend suffered a brain injury, I would be willing to continue our friendship
3. Helping behaviour	14	I would probably help someone with a brain injury, even if they weren't putting much effort into helping themselves
4. Blame attributions	8	Brain injury often results from the person's own actions and behaviour
5. Trustworthiness	12	Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life'
6. Fear and avoidance	14	I would feel unsafe in the presence of someone with brain injury

Pilot Study

Evaluating the Content Validity of the Initial Item Pool of Knowledge Based Items: The Perception of Brain Injury Measure (PBIM)

3.4 Pilot Study Aims

‘Expert judges’ are considered knowledgeable about the core construct under investigation and are therefore well placed to evaluate the representativeness of knowledge-based items (Boateng et al., 2018; DeVallis, 2012). Thus, this pilot study specifically focused on evaluating the content validity of the knowledge-based item pool, as it was expected that experts in the field of brain injury would be able to discriminate between items that were ‘true’ or ‘false.’

3.5 Methods

3.5.1 Participants

Twenty-five professionals working in the field of brain injury were invited by email to participate. Participants were identified by the research team (CW and AW) as suitable for inclusion in this study and were nominated based on their professional role (e.g., consultant psychologist, case manager) and work setting (e.g., neurorehabilitation and community rehabilitation settings).

Fourteen professionals (56% response rate) completed the study and were therefore included in the analysis. Participants’ ages ranged from 35-61 (M = 48.5, SD = 7.61). Other demographic and professional background information is presented in Table 3.3.

Table 3.3

A Summary of Demographic and Professional Background Information

Demographics and professional background	Professional group (N = 14)	
	N	%
Gender		
Male	5	35.7%
Female	9	64.3%
Ethnicity		
White	13	92.9%
Not stated	1	7.1%
Level of education		
Sixth form/ college	1	7.1%
First degree	3	21.4%
Master's degree	2	14.3%
PhD/ Doctorate	8	57.1%
Professional role		
Consultant psychologist	3	21.4%
Psychologist	4	28.6%
Speech and language therapist	1	7.1%
Occupational therapist	1	7.1%
Case manager	3	21.4%
Hospital /Operations director	2	14.3%
Primary work setting		
Community based rehabilitation	9	64.3%

Neurorehabilitation	2	14.3%
Academia	1	7.1%
Memory-based service	1	7.1%
Case management	1	7.1%
% Working time dedicated to TBI patients		
81-100% of time	5	41.7%
61-80% of time	4	33.3%
41-60% of time	1	8.3%
21-40% of time	1	8.3%
0-20% of time	1	8.3%
Not work directly with TBI patients	2	14.3%

Drawn from a range of professional backgrounds (see Table 4.3), participants (n=12)[2] reported having worked in the field of brain injury for between 5 and 27.75 years (*M* = 19.9, *SD*= 7.78), with most of these (75%, n = 9) also reporting that they had spent ≥61% of their professional role working with individuals with TBI. Of the 14 participants, 12 (85.7%) indicated that had direct contact with individuals with TBI in their working role. The remaining participants (14.3%, n=2) indicated no direct contact with those with TBI, but still met the inclusion criteria of working in a relevant neuro-specialist work setting with an appropriate professional role (e.g., hospital/service director managing and overseeing services for those with TBI).

[2] Two participants did not answer this question.

3.5.2 Design

This pilot study was designed to examine the content validity of knowledge-based perception items by identifying items in the initial item pool which demonstrated either consistent or inconsistent responding in a group of professionals working in the field of brain injury.

3.5.3 Materials

The materials included in this study included the 172 knowledge-based items shown in Table 3.1, plus 18 distractor items (see also Appendix A). All items were rated on a 7-point Likert scale with the response options 1= Definitely False, 2 = Probably False, 3 = Possibly False, 4= Uncertain, 5 = Possibly True, 6 = Probably True, and 7 = Definitely True. Seven attentional checks (e.g., '*Please select option: Definitely False*') were also included, one representing each scale point. Attentional control checks questions are commonly added to questionnaires to make sure that participants' attention is high and in order to check that data is reliable. In this study, attentional control checks were included in the pilot study to allow evaluation of the rate of attentional control check fails and therefore, facilitate development of thresholds for exclusion criteria for future research. No responses were excluded on the basis of attentional control check fails in the pilot study.

3.5.4 Procedure

Ethical approval was granted by Swansea University, Department of Psychology Research Ethics Committee (reference: 0333; see Appendix B for approval letter). Professionals working in the field of brain injury were invited by email to participate in the ‘Development of a Perception of Brain Injury Measure’ pilot study via Qualtrics (www.qualtrics.com). Participants were informed that the research was being conducted to develop a new perception measure of brain injury, would take approximately 15 minutes, and that their responses would help in the early development stage of the new measure. Participation was entirely voluntary, with no participant reimbursement or compensation arrangements in place. On clicking through to the study, participants were presented with an information page which outlined the purpose of the research, as well as data protection and confidentiality arrangements. Participants were then asked to create their own unique identifier and to keep a copy for their personal records. Participants were informed that should they later wish to withdraw their data from the study, that they would need to supply the unique identifier so their responses could be identified for removal. After consenting, participants were asked to provide standard demographic information (e.g., gender, age, occupation) and to answer questions about their professional role and experience (see Appendix C).

Participants then responded to 197 items, which included 172 ‘knowledge’ based items, 18 distractor items and 7 attentional control check items. Participants were asked to rate how true or false they considered each statement and were prompted to respond to any questions that were missed before finishing. All participants were presented with the same set of survey items, but presentation order was randomised across participants. On completion, participants were informed how their responses would help identify any redundant and/or non-discriminatory items and were thanked for their time.

3.5.5 Statistical Analysis

The following criteria were used to determine the content validity of each item: (1) the mean score from the expert sample needed to be ≥ 6.0 for 'true' items and ≤ 2.0 for 'false' items; (2) 11 of the 14 experts had to respond in the correct direction (possibly, probably, or definitely true for 'true' items; possibly, probably, or definitely false for 'false' items). Items that did not meet these criteria were removed from the pool. Distractor items were included as items which were demonstrably 'false' (except one 'true' item), where it was anticipated that professionals would score these as 'false' (e.g., mean values less than 2.0 and 11 of the 14 expert opinions responding in the correct direction).[3]

[3] Four items had one missing response; for these items, means were calculated across the 13 completed responses.

3.6 Results

For each item, the mean, mode, minimum and maximum score was calculated. Within each domain, items were ordered from most to least consistent responding according to the frequency of positive, negative, and uncertain responses. For positively worded (true) items, mean values closer to 7 indicated good item consistency, whereas for negatively worded (false) items, mean values closer to 1 indicated good item consistency. The mode indicated which scoring response was most frequently endorsed, with 6-7 for positively worded items and 1-2 for negatively worded items indicating good response consistency. Additionally, minimum and maximum values were assessed to determine the range of responses to each item, with narrower ranges indicating better scoring consistency. Each item was evaluated individually using these parameters to determine item retention or removal.

3.6.1 Item Retention

The main criterion for retaining items for the next phase of testing was item responses with 11 (~ 78.5%) or more endorsements in the anticipated scoring direction (either positive or negative). Additionally, mean, mode, minimum and maximum values were also checked as described above. From the pool of knowledge-based items, 50 did not meet this minimum threshold and were identified as candidates for removal. In contrast, 122 items demonstrated good item consistency and were retained. Table 3.4 shows how many items were retained from each domain after all inclusion and exclusion criteria were applied, with example items and corresponding response patterns also captured.

In addition, the 18 distractor items were also evaluated. The inclusion of these items was intended to represent symptoms unrelated to brain injury, and therefore, endorsements were expected to be keyed as false (except for the single positively keyed item). However, scoring patterns were generally inconsistent, with some scored in the reverse direction than anticipated, with mean values above 5. One item (*'It is common for people with brain injury to experience paranoid thoughts'*) also had 11 endorsements in the positive direction. Consequently, 15 (73%) distractor items were identified for removal, with only three retained for further field testing (see Table 3.4). All three had 10 or more endorsements in the anticipated direction, with two representing symptoms of physical health conditions and the remaining symptoms of a mental health disorder.

Table 3.4

Items Retained for Further Psychometric Testing in a General Population Sample

Domain	n items retained (N originally in domain)	Example items from each domain	% Positive responses for item[a]	% Negative responses for item[b]	% Undecided responses for item[c]	Mean	Mode	Min/ Max
Causes of brain injury	7 (10)	A brain injury sustained early in life (e.g., childhood, adolescence) can have negative consequences across the lifespan (P)	100%	0%	0%	6.64	7	5 -7
		Brain injury can occur without a direct blow to the head (P)	100%	0%	0%	6.64	7	5-7
		Some degree of brain damage is probably fine, as we only use 10% of our brain anyway (N)	0%	100%	0%	1.29	1	1-3
Identification of brain injury	18 (24)	The effects of brain injury are often hidden and/or invisible (P)	100%	0%	0%	6.5	7	5-7
		The effects of brain injury are not always obvious (P)	100%	0%	0%	6.57	7	5-7
		A brain injury is a serious condition which significantly affects a person's quality of life (P)	100%	0%	0%	6.71	7	6-7
Perceptions of recovery	21 (33)	The impact of brain injury is enduring and long-lasting (P)	100%	0%	0%	6.43	6	6-7
		Brain injury is a chronic and debilitating condition (P)	100%	0%	0%	6.43	7	5-7
		The effects of brain injury do not resolve quickly (P)	100%	0%	0%	6.57	7	6-7
Effects of concussion and unconsciousness	11 (14)	Concussion is not a serious event (N)	0%	100%	0%	1.57	1	1-3
		Brain injury always involves a loss of consciousness (N)	0%	100%	0%	1.57	1	1-3
		Concussion can result in brain injury (P)	100%	0%	0%	6.15	7	5-7

Understanding changes in the individual	19 (21)	Changes in a person's personality are uncommon after brain injury (N)	0%	100%	0%	1.43	1	1-2
		A brain injury can cause a sudden change in a person's personality (P)	100%	0%	0%	6.57	7	5-7
		A brain injury does not affect a person's family and/or loved ones (N)	0%	100%	0%	1.43	1	1-7
Social consequences	12 (21)	Being able to read other people's emotions can be affected by brain injury (P)	100%	0%	100%	6.71	7	6-7
		The ability to appropriately recognise and read social cues can be more difficult after brain injury (P)	100%	0%	0%	6.64	7	6-7
		Brain injury affects a person's ability to empathise with the emotional needs of others (P)	100%	0%	0%	6.14	6	5-7
Brain injury coherence	4 (5)	The effects (if any) of brain injury are obvious to the person with brain injury (N)	0%	100%	0%	1.86	2	1-3
		People with brain injury find it difficult to adapt to the consequences (if any) of their brain injury (P)	86%	7%	7%	5.79	6	3-7
		In general, the consequences of brain injury are not well understood (P)	86%	14%	0%	5,79	6	3-7
Behavioural control and responsibility	4 (11)	People with brain injury lack awareness of the impact of their behaviour on others (P)	100%	0%	0%	5.79	5	5-7
		A person with brain injury is normally a social conformist, following social rules and norms (N)	7%	93%	0%	2	1	1-5
		A person with brain injury is fully in control of their actions (N)	14%	86%	0%	2.36	1	1-6
Risk factors	8 (9)	The number and quality of social relations are not usually disrupted by brain injury (N)	0%	100%	0%	1.29	1	1-3
		Many people with brain injury are at an increased risk of homelessness (P)	93%	0%	7%	5.57	5	4-7
		Financial strife after brain injury is commonplace (P)	93%	0%	7%	5.86	5+7	4-7
Perceptions of motivation and effort	5 (9)	A lack of progress after brain injury signifies a lack of effort (N)	0%	100%	0%	1.71	2	1-3

		A person with brain injury has full control and power over their symptoms (N)	0%	100%	0%	1.43	1	1-3
		Nothing a person does will affect their recovery or outcome after brain injury (N)	0%	100%	0%	1.43	1	1-3
Understanding changes in mood after brain injury	13 (15)	High levels of anxiety are common after brain injury (P)	100%	0%	0%	5.93	5	5-7
		The effects of brain injury can lead a person to feel a range of negative emotions (e.g., anger, frustration) (P)	100%	0%	0%	6.64	7	5-7
		The likelihood of depression does not increase after brain injury (N)	0%	100%	0%	1.57	1	1-3
Distractor items	3 (18)	Arthritis and rheumatoid conditions frequently appear shortly after brain injury (N)	7%	79%	14%	2.07	1	1-5
		Most people after brain injury experience delusions and hallucinations (N)	14%	79%	7%	2.21	1	1-5
		Itchy, red and watering eyes are common symptoms after brain injury (N)	7%	71%	21%	2.21	1	1-5

Note: [a]Possibly/Probably/Definitely True responses (scores 5-7) [b]% Possibly/Probably/Definitely False responses (scores 1-3) [c]Undecided (score 4)

3.6.2 Candidates for Removal

The 50 knowledge-based items identified as candidates for removal were then further scrutinised for the following reasons. Across the domains, the proportion of items identified as candidates for potential removal ranged from 10% ('Understanding changes in the individual') to 55% (Behavioural control and responsibility). First, items which had 10 endorsements or fewer in the expected direction were cross referenced against other parameters, including checking mean values to see if they were between 2 and 6, and reviewing the modal, minimum and maximum scores. Second, one further additional item with 11 endorsements in the expected direction but with a mean value above 2 was also identified as a candidate for removal at this stage. The latter item belonged to one of the largest domains – 'Understanding changes in mood after brain injury.' Thus, 42 of the 50 items were removed at this stage (see Table 3.5). The remaining eight items from the 50 identified as initial candidates for removal were then subjected to additional scrutiny as explained in the next section (see below, section 3.6.3).

3.6.3 Revisiting Knowledge Items: Reducing Ambiguity and Clarifying Meaning

The remaining eight of the 50 items that were originally identified as candidates for exclusion were further examined, with wording/phrasing revised to improve clarity and to reduce ambiguity in their meaning. The rationale for the retention and revision to items at this stage was to ensure that each domain had sufficient items remaining after exclusions to maintain sufficient breadth of coverage. Of the eight items reviewed, two were reworded to reduce any perceived ambiguity in their meaning; for example, '*Mimicking the effects of brain injury is easy*' was amended to '*Anyone can easily mimic the effects of brain injury*.' Additionally, one positively worded item received responses in the opposite direction than anticipated (i.e., it had 11 negative endorsements and only two positive endorsements). Again, due to limited item coverage in its respective domain, this item was reworded to improve clarity ('*Most people with brain injury get into trouble with the law*' became '*Having a brain injury increases the likelihood of getting into trouble with the law*') and was subsequently retained. After some minor revisions in wording to improve clarity and provide additional context to participants, the remaining six items, which had 10 endorsements in the anticipated direction, were kept for further testing. For example, '*After a coma, a person can be completely normal'* was changed to *'After a coma, most people will be completely normal.'*

In addition to amending existing items as outlined above, a new item was also generated – '*After brain injury, behaviour is often rational and intentional.*' This was because over half (54.5%) of the 'Behavioural control and responsibility' domain items were removed as they met the exclusion criteria. However, the remaining five items did not provide adequate coverage of all areas under this domain, and excluded items could not be adequately revised or adapted to address this.

In sum, at this stage of item analysis eight revised items were retained in the PBIM and one new item was generated. Together with the 122 items that were originally retained, this led to a total of 131 PBIM items which were put forward for further psychometric analysis.

3.6.4 Attentional Control Checks

On average, response accuracy was calculated for the seven attentional control checks in the PBIM. Across all participants (n = 13), there were five errors out of a possible 91, resulting in a response accuracy of 94.5%. At this stage, however, no participants were excluded for failing attentional control checks. Instead, this data will inform the exclusion criteria for future research (see section 3.9.1).

Table 3.5

Items Removed, with Example Items, from Further Psychometric Testing in a General Population Sample

Domain	n items removed (N originally in domain)	Example items from each domain	% Positive responses for item[a]	% Negative responses for item[b]	% Undecided responses for item[c]	Mean	Mode	Min/ Max
Causes of brain injury	2 (10)	The impact of brain injury depends on the cause (e.g., fall, road traffic incident, sports injury) (N)	36%	64%	0%	3.07	1	1-7
		Childhood brain injuries are much more serious than adult brain injuries (N)	50%	50%	0%	3.57	5	1-7
Identification of brain injury	5 (24)	The symptoms of mental illness closely resemble those of brain injury (N)	57%	36%	7%	3.86	5	1-6
		A brain scan is the best way to detect brain injury (N)	57%	36%	7%	4.21	6	1-7
Perceptions of recovery	10 (33)	The speed in which someone recovers after a brain injury depends on their commitment to get better (N)	36%	64%	0%	3.36	3	1-7
		Without support, people with brain injury continue to improve and get better several years after injury (N)	43%	50%	7%	3.43	5	1-6
Effects of concussion and unconsciousness	2 (14)	After a person is knocked unconscious they can carry on as normal (N)	36%	57%	7%	3.36	5	1-5
		A concussion rarely results in long-term difficulties for a person (N)	43%	57%	0%	3.5	5	1-6
Understanding changes in the individual	2 (21)	Many people experience difficulties with their speech after brain injury (P)	71%	21%	7%	5.57	7	3-7

		Movement disorders are not normally associated with brain injury (N)	21%	71%	7%	2.64	2	1-7
Social consequences	7 (21)	People with brain injury behave considerately towards others (N)	29%	57%	14%	3.43	3	1-6
		People with brain injury are charged with more criminal offences than those without (P)	36%	50%	14%	4.36	6	1-7
Brain injury coherence	1 (4)	Advances in science means that we have an excellent understanding of the different ways in which brain injury may affect a person (N)	57%	43%	0%	4.21	6	1-7
Behavioural control and responsibility	6 (11)	People with brain injury are more likely to commit crimes (P)	64%	21%	14%	4.71	5	1-7
		Most people with brain injury do not carry out actions with clear intentions and purpose (P)	50%	50%	0%	3.93	2+3	1-7
Risk Factors	1 (9)	Most people with brain injury do not function independently (P)	29%	71%	0%	3.14	2+3	1-6
Perceptions of motivation and effort	4 (9)	How quickly a person with brain injury recovers does not depend on how committed they are to getting better (P)	71%	29%	0%	4.86	5	1-7
		A person with brain injury has limited power to influence and control its effects (P)	71%	29%	0%	4.71	5	2-7
Understanding changes in mood after brain injury	2 (15)	Mood and behaviour is stable and unchanging after brain injury (N)	21%	79%	0%	2.29	1	1-7

		After brain injury, many people can successfully moderate their own behaviour in social situations (N)	43%	57%	0%	3.79	3 + 5	1-7
Distractor items	15 (18)	Engaging in repetitive movements (e.g., hand flapping, finger twisting, rocking back and forth) is common after brain injury (N)	36%	57%	7%	3.29	1	1-7
		Shortness of breath and breathing difficulties (e.g., asthma) are far more prevalent after brain injury than the general population (N)	7%	57%	36%	2.93	4	1-6

Note: [a]Possibly/Probably/Definitely True responses (scores 5-7) [b]% Possibly/Probably/Definitely False responses (scores 1-3) [c]Undecided (score 4)

3.7 Phase One: Conclusions

This first phase of scale development led to an initial pool of items which mapped across two distinct brain injury constructs: (1) Knowledge-based perceptions; (2) Attitude-based perceptions. For the knowledge-based perception items, later developed into the Perception of Brain Injury Measure (PBIM), an initial pool of 172 items spanning 11 domains was generated, alongside 18 distractor items and seven attentional control checks. For the attitude-based item pool, later developed into the Brain Injury Awareness Scale (BIAS), 77 items that spanning six domains were generated, alongside seven attentional control checks.

For the knowledge-based items, a pilot study was conducted with brain injury professionals to evaluate the content validity of the initial item pool. Items which showed little discriminatory value were removed and/or revised to improve clarity and meaning, leaving a remaining pool of 131 items which mapped across the 11 existing knowledge domains. Three distractor items were also retained at this stage along with the seven original attentional control checks for further field testing.

In sum, at the end of the first phase of item development 84 items were generated for the BIAS, including 77 attitude-based items and seven attentional control check questions. For the PBIM, 141 items were retained after the pilot study, of which 131 were knowledge-based items, three were distractor items and seven attention control check questions. Both of these item pools were then put forward for psychometric testing in a general population sample.

Phase Two: Scale Development

3.8 Aims

The second phase of scale development focused on field testing the Brain Injury Awareness Scale (BIAS) and the Perceptions of Brain Injury Measure (PBIM) item pools in a target sample aimed to represent the general adult population. The aim of this stage was to: (1) refine the items of these two measures through a process of item reduction using exploratory factor analysis, and (2) evaluate the internal consistency of the resultant scale and subscales.

3.9 Methods

3.9.1 Participants

Participants were recruited through the online participant recruitment platform 'Prolific' (www.prolific.co), with the study advertised as 'Development of a Perceptions of Brain Injury Measure.' Participants were pre-screened through the Prolific site to ensure that they met the following eligibility criteria: (1) first language English; (2) at least 18 years of age, and (3) minimum approval rating of 90% on the prolific site (i.e., at least 90% of their previous Prolific submissions had been approved). A total sample of 419 participants took part in exchange for a monetary payment of £2.50. Participants were subsequently excluded if they met either or both of these *a priori* exclusion (screening) criteria agreed by researchers (CW, RH and EB): (1) if they completed the study in less than 10 minutes, and (2) if they failed three or more of the 14 attentional control checks embedded in the survey. Please note that the rate of attentional control check accuracy provided by the pilot study (94.5%; see section 3.6.4) was initially considered as threshold. However, given the low sample size (n=13) and the high rate of accuracy in the pilot, as well as the addition of seven attentional control checks in the BIAS, a lower threshold (3/14 attentional control check fails) was applied for data exclusions here. This led to the exclusion of 19 participants (two for completion times, 14 for attentional control check fails, and three for both) and a final sample of 400 participants - thus exceeding recommended thresholds (n=300) for performing factor analysis (Comrey & Lee, 1992) and for stable factor solutions to emerge (Field, 2018). Overall, 67.5% (n = 279) of the sample were female and ages ranged between 18-74 years (M = 33.35, SD = 23.24). Further demographic information is presented in Table 3.6.

Table 3.6

Summary of Demographic Characteristics

Demographic characteristics	**Prolific Sample (N = 400)**	
	n	*%*
Gender		
Male	129	32.3%
Female	270	67.5%
Gender not stated	1	0.3%
Ethnicity		
White	346	96.5%
Multiple ethnic groups	13	3.3%
Asian	25	6.3%
Black	11	2.8%
Latino/Hispanic	2	0.5%
Other or prefer not to say	3	0.8%
Educational attainment		
No formal education	3	0.8%
Secondary School	67	16.8%
Sixth form/ college	105	26.3%
First degree	160	40%
Master's degree	50	12.5%
PhD/ Doctorate	8	2%
Other	7	1.8%
Employment status		
Full time employment	165	41.3%
Part-time employment	81	20.3%
Retired	5	1.3%
Unpaid carer	37	9.3%
Not working due to	23	5.8%
Actively seeking employment	18	4.5%
Volunteer	2	0.5%
Full time student	64	16%
Part-time student	5	1.3%
Country of residence		

Australia	32	8%
Canada	25	6.3%
Germany	1	0.3%
Ireland	6	1.5%
Italy	1	0.3%
New Zealand	5	1.3%
Portugal	1	0.3%
United Kingdom	276	69%
USA	53	13.3%

Participants' experience familiarity with and exposure to brain injury was also measured using an adapted version of the Level of Contact (LOC) form (see Holmes et al., 1999) which was scored across 12 ranks (see section 3.9.3.4 below). The modal rank was rank 4 ('*I have watched a documentary on the television and internet about brain injury'*), which was selected by 108 (27%) participants. Participants were also grouped into one of three categories depending on their reported level of proximity to brain injury (see section 3.9.3.4 for more details): These categories were: (1) low (n = 236, 59%); (2) medium (n = 53, 13.3%), and (3) high (n = 111, 27.8%).

3.9.2 Design

This study was a questionnaire-based research design to facilitate the development of two measures, namely the PBIM and BIAS. Two other measures were included in this study, an adapted version of the LOC (Holmes et al., 1999) and the Marlowe- Crowne Social Desirability Scale (SDS: Crowne & Marlowe, 1960). The LOC was included to measure participant's level of proximity (e.g., familiarity /exposure) to brain injury, which has typically been overlooked in misconception research (Block et al., 2016). SDS was included to identify any items in the PBIM and BIAS which may be worded in a way that makes them susceptible to socially desirable responding, and therefore, of little utility. Thus, the purpose of including the SDS was to help establish construct validity of the two new measures, where a low correlation between the overall SDS score and items from both the BIAS and PBIM would indicate that responses were unlikely to have been driven by socially desirable responding (see King & Bruner, 2000).

3.9.3 Materials

Four measures were included in this study. These were the initial 77-item pool BIAS and 131-item pool for the PBIM, as well as the LOC (see Holmes, et al., 1999) and SDS (Crowne &Marlowe, 1960).

3.9.3.1 Perception of Brain Injury Measure (PBIM)

The PBIM was designed to measure knowledge and understanding of brain injury. The measure contained a total of 141 items - 7 attentional control check questions (e.g., '*Select option: Definitely True*'), three distractor items, and 131 knowledge- based items covering 11 domains (see Table 3.4). All items were rated on a 7-point Likert scale with the response options 1= Definitely False, 2 = Probably False, 3 = Possibly False, 4= Uncertain, 5 = Possibly True, 6 = Probably True, and 7 = Definitely True. Knowledge-based items were scored so that a higher score equated to more accurate knowledge. Items where the correct answer was "false" were reverse scored prior to analysis. This measure contained both True (34.14%) and False (64.86%) items.

3.9.3.2 Brain Injury Awareness Scale (BIAS)

The BIAS was designed to measure attitude-based perceptions of brain injury. The measure contained a total of 84 items: 7 attentional control check questions (e.g., '*Select option: strongly agree*) and 77 items that tapped into the domains of empathy, social inclusion and fear and avoidance (see Table 3.2 for example items and Appendix D for full list). Items were rated on a 7-point Likert scale where 1 = Strongly Agree, 2 = Agree. 3 = Somewhat Agree, 4 = Neither Agree nor Disagree, 5= Somewhat Agree, 6 = Agree, and 7 = Strongly Agree. For the 77 attitude-based items, scoring meant that higher scores equated to more positive attitudes. This measure contained both positively (47%) and negatively (53%) worded items, with negatively worded items reverse scored prior to analysis (see Appendix D).

3.9.3.3 The Marlowe-Crowne Social Desirability Scale (SDS; Crowne and Marlowe, 1960)

The SDS is a 33-item scale that measures the tendency for individuals to present themselves favourably according to their social customs and norms (King & Bruner, 2000.) Items comprise statements related to personal attitudes and traits, and participants are asked to respond to each item as either 'true' or 'false.' For 18 items, the socially desirable response was 'true' (e.g., '*Before voting I thoroughly investigate the qualifications of all the candidates*') and if selected, participants would receive a score of 1 for each 'true' response. For the remaining items, the socially desirable response was 'false' (e.g., '*If I could get into a movie without paying and be sure I was not seen I would probably do it'*) and if selected, participants would receive a score of 1 for each 'false' response. A total SDS score was calculated by summing all scores, with total scores ranging from 1-33 and higher scores indicating higher levels of socially desirable responding. The internal consistency for the SDS was acceptable in this study (α=.79) and good test-retest reliability (*r* =.89) has previously been reported (Crowne & Marlowe, 1960). From a review of associated literature, social desirability appears to have been routinely neglected in scale construction research, but when it has been measured, the SDS is typically the tool of choice (King & Bruner, 2000; see Appendix E).

3.9.3.4 Level-of-Contact Report (LOC; adapted from Holmes et al., 1999)

The LOC was originally developed for measuring familiarity with, and exposure to severe mental illnesses, namely Schizophrenia (Holmes et al., 1999), and has been used regularly (and in adapted forms also) in research exploring attitudes towards mental illness (e.g., P. Corrigan et al., 2003; Holmes et al., 1999). An adapted version of the 12-item scale was used by changing the phrase 'mental illness' to 'brain injury' in each statement, thereby providing a measure of proximity to brain injury. Furthermore, the words 'or internet' was added to one statement (rank 4) '*I have watched a documentary on the television or internet about brain injury.'*

On completion, participants were asked to tick all statements that applied to them, with their final score corresponding to their highest ranked score. For example, a participant who checked '*I have observed, in passing, a person I believe may had had a brain injury*' (rank score = 2) and '*A friend of* *the family has a brain injury'* (rank score = 9) would receive a final rank score of 9. Scores could range from 1 ('*I have never observed a person that I was aware had a brain injury*') to 12 ('*I have a brain injury.*) In addition to ranked data, responses were also grouped into three categories to provide an index of overall 'level of proximity' based on: (1) little or limited proximity to brain injury (low proximity = 1; rank scores 1-4); (2) providing services and work-related proximity (medium proximity = 2 – rank scores 5-8); and (3) personal and familial proximity with individuals with brain injury (high proximity = 3 – rank scores 9-12). The presentation order of the 12 LOC statements were fixed for each participant in line with the original version (see Holmes et al., 1999; see Appendix F).

3.9.4. Procedure

Ethical approval was granted by Swansea University, Department of Psychology Research Ethics Committee (reference: 0338; see Appendix G). The study was conducted through the online survey platform 'Qualtrics.' Prolific advertised the study 'Development of a Perception of Brain Injury Measure' through their own site to their participant pool, providing the Qualtrics link and study information. Participants were paid £2.50 for participating. On clicking through to the study, participants were first presented with the information page, outlining the purpose of the research and likely duration of the study (25- 30 minutes), what would happen to them if they took part, and relevant data protection and confidentiality arrangements. This was followed by a consent page and then participants were asked to provide their Prolific ID, which was a requirement of the platform. Participants were also informed that they could contact the researcher with their Prolific ID should they later wish to withdraw their data from the study. Participants were then asked to complete some standard demographic questions (see Appendix H), followed by the LOC questions. Participants then completed the SDS, PBIM and BIAS, in a randomised order. Presentation order of items within each of these latter scales was also randomised for each participant. Forced responding was used throughout, with participants prompted and required to respond to any incomplete answers so there would be no missing data. At the end of the study, participants were presented with a debrief form which outlined how their responses would help validate the two new perception measures.

3.10 Results

3.10.1 Stage 1: Item Screening of the PBIM

To determine whether any items should be removed prior to conducting factor analysis, descriptive statistics were calculated for each PBIM item (n = 131), and all items were screened to identify items with ceiling effects, items susceptible to socially biased responding, and items with low variability. As this scale was designed to measure the range of perceptions and misperceptions about brain injury that members of the general population may hold, items which have a low frequency of responding at the 'misconception' side of scoring have low utility. Thus, the criteria for exclusions in this first phase of item reduction was: (1) mean values above 6, indicating a potential ceiling effect; (2) Pearson product moment correlation above .3 (moderate correlation; Cohen, 1988) with SDS scores (see Appendix I), and (3) fewer than 5% of participants providing responses that indicate misconceptions (possibly, probably, or definitely false for 'true' items; possibly, probably, or definitely true for 'false' items).

In total, 37 items were excluded following this screening process (see Table 3.7 for examples). Four items had both mean values over six and scored less than 5% in the reverse direction, two items had mean values above and 6, and 31 items scored less than 5% in the reverse direction. No items were excluded on the basis of correlations above .3 with SDS scores, signifying that items in the PBIM pool were unlikely influenced by socially desirable responding. Items were excluded from all but two domains ('Brain injury coherence' and 'Behavioural control and responsibility'), with the domain 'Understanding Changes in mood after brain injury' losing the most items (eight of the 13 original items); only one item was removed from 'Risk Factors' (out of eight items) domain.

In sum, 37 PBIM items were removed, leaving 94 PBIM items for an exploratory factor analysis. Please note that distractor items and attentional control checks were not included in this exploratory factor analysis.

Table 3.7

Example Exclusions based on Item Screening

Item	Mean	Correlation with SDS	% Of responses in the reverse direction
A lack of progress after brain injury signifies lack of effort (N)	6.06	-.027	6.5%
A sports concussion can have long-lasting impacts (P)	5.85	-.026	3.75%
Brain injury can be as serious as a chronic physical health condition (e.g., diabetes, heart disease) (P)	6.08	-.018	4.75%

3.10.2 Stage 2: Exploratory Factor Analysis of 94 PBIM Items

A principal axis factor analysis was conducted on the 94 remaining PBIM items using oblique rotation (direct oblimin). Oblique rotation was used as underlying constructs were likely to be related (see Yong & Pearce, 2013). The Kaiser–Meyer– Olkin measure of sampling adequacy was 0.88, indicating that factor analysis should reveal reliable factors (Kaiser, 1970; Kaiser & Rice, 1974), and Bartlett’s Test for Sphericity (Bartlett, 1954) was significant (p <.001). These tests were used to determine suitability of the variables for factor analysis, and overall analysis showed that they demonstrated good factorability.

Initial analysis was conducted to evaluate the eigenvalues for each item, revealing 26 factors with eigenvalues above 1 and explaining 63.48% of the total variance. However, scree plot examination is often considered a superior method for factor extraction than Kaiser criterion (A.B. Costello & Osborne, 2005), with this revealing three possible solutions of five, six and seven factors. The factor structure of each of these three possible solutions were examined for the most appropriate fit. As factor loadings of at least .3 are considered desirable for samples above >300 (Stevens, 2002; Tabachnick & Fidell, 2007), loadings below 0.3 were suppressed to explore initial factor solutions. However, in each solution, one large factor was dominant and the items in this factor did not fit together under a readily interpretable theme. Additionally, the items in the dominant factor were all negatively worded, so there was concern that the items were grouping due to response set rather than conceptual relationships. Consequently, as no theoretically interpretable factor structure was found at this stage, further item screening with more stringent exclusion criteria was carried out.

3.10.3 Stage 3: Further Item Screening and Exclusions of the PBIM

Further item screening was conducted due to the prominence of a large initial factor across all three possible factor solutions (5, 6 and 7-factor solution). Namely, items with a mean value above 5.5 (previously above 6.0) were excluded. This led to an additional 15 items from six domains being excluded, leaving 79 items in the PBIM item pool to put forward for further testing.

3.10.4 Stage 4: Factor Analysis of the 79 Item PBIM

An exploratory factor analysis (EFA) was conducted on the remaining 79 items, with preliminary checks indicating that data was suitable for factor analysis; Kaiser– Meyer–Olkin measure of sampling adequacy was 0.87 and Bartlett's Test for Sphericity was significant (p <.001).

Principal axis factoring (PAF) indicated seven factors with eigenvalues above 1, explaining 37.77% of the total variance. A scree plot of eigenvalues revealed four possible solutions of four, five, six or seven factors. PAF was performed again on the remaining 79 items to extract the factors with oblique Oblimin rotation. This was an iterative process, whereby each factor solution was reviewed for its perceived conceptual fit; items retained at this stage had factor loadings above 0.4. However, as factor analysis ultimately relies on the researcher to inspect and interpret how items are grouped and conceptually linked, decisions were guided by both statistical and theoretical considerations.

A 6-factor solution was deemed the best fit both conceptually and statistically, as each factor had multiple items loading above 0.4 on a primary factor, and each represented a clear conceptual theme. Of the 79-item pool, 39 items loaded across the 6-factors (see Table 3.8) when items below 0.4 were suppressed. Three items had cross-loadings above 0.3 in a second factor but were retained in the primary factor as this was considered the better fit conceptually. A total of 40 items were eliminated because they had factor loadings below 0.4. Further examination of individual factors revealed that the largest factor had 14 items loading above 0.4 but it included two items ('*Having to use a wheelchair on a daily basis because of a disability indicates a more debilitating condition than brain injury*' and '*A physical disability (e.g., having to use a wheelchair/ mobility aid) is more debilitating than a brain injury'*) that seemed to be conceptually unrelated to the other items, but also did not fit into another factor. Consequently, these two items were removed from further reliability analysis.

Table 3.8

Factor Loading based on Principal Axis Factoring with Oblimin Rotation for 39-Items of the PBIM

PBIM items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Anyone can easily mimic the effects of brain injury	0.52					
A physical disability (e.g., using a wheelchair/mobility aid) is more debilitating than a brain injury[a]	0.52					
Losing your sense of role and purpose in life is not normally a consequence of brain injury	0.51					
Sleeping difficulties are uncommon after brain injury	0.51					
Compared to the general population, rates of depression are no different in people with brain injury	0.49					
Having to use a wheelchair on a daily basis because of a disability indicates a more debilitating condition than brain injury[a]	0.48					
The likelihood of depression does not increase after brain injury	0.48					
Decision making is not typically affected by brain injury	0.46					
Getting angry easily and quickly is not normally associated with brain injury	0.44					
A person with brain injury is fully in control of their actions	0.44					
Changes in a person's personality are uncommon after brain injury	0.44					
Physical, memory and social recovery occur at the same rate following brain injury	0.43					
A person with brain injury can easily exaggerate their symptoms	0.43					

The effects of brain injury are often insignificant and unremarkable	0.40			
Many people with brain injury are at an increased risk of homelessness		0.66		
Brain injury increases the risk of using illegal substances (e.g., drugs)		0.59		
Having a brain injury increases the likelihood of getting into trouble with the law		0.58		
A person who is homeless is at a greater risk of experiencing a brain injury		0.41		
The impact of concussion is cumulative (the impact becomes greater with each individual concussion)			0.74	
The severity of brain injury increases with each additional concussion			0.74	
The more concussions you experience, the more damaging they become			0.71	
A concussion is normally harmless			0.46	
Having one brain injury increases the chances of having another			0.42	
The impact of childhood brain injury can take years to become apparent			0.40	
People with brain injury have a good understanding of the impact of their brain injury on themselves and others				0.63
Most people have a clear picture and understanding of how their brain injury may have affected them				0.53
A person with brain injury best understands the consequences of their injury on themselves and others				0.51

A person with brain injury lacks awareness and understanding of the consequences of their actions				0.46		
People with brain injury lack awareness of the impact of their behaviour on others				0.44		
The effects (if any) of brain injury are obvious to the person with brain injury				0.40		
A complete recovery after brain injury is unlikely, even if the person tries hard to get better					0.56	
The effects of brain injury are permanent					0.52	
Returning to work after brain injury is commonplace					0.48	
A person is unlikely to return to their normal self after a brain injury					0.41	
Physical recovery from brain injury is a good indicator of overall recovery						-0.49
Evidence of brain injury is always detectable from a brain scan						-0.46
Recovery after brain injury is focused on achieving good physical outcomes						-0.45
The primary goal of brain injury rehabilitation is to improve physical functioning						-0.45
Brain injury mostly affects memory, but in other ways a person can be completely normal						-0.41
Eigenvalues	13.38	4.32	3.38	2.33	2.23	2.04
% Variance	16.93%	5.47%	4.28%	2.95%	2.82%	2.58%

Note. [a]items removed from the scale after factor extraction. Factor loadings < .4 are suppressed

The final 37-item scale had six readily interpretable factors: (1) ‘Signs and symptoms of brain injury’ (12 items); (2) ‘Social determinants and consequences of brain injury’ (four items); (3) ‘Severity and impact of brain injury’ (six items); (4) ‘Insight’ (six items); (5) ‘Permanence of brain injury’ (four items), and (6) ‘Physical and medical expectations’ (five items). Internal consistency for the final 37-item scale and six subscales was measured using Cronbach’s alpha (Cronbach, 1951), where an α of .5 is deemed an acceptable threshold for subscale consistency in early exploratory research (see Nunnally, 1978). Cronbach’s α was excellent for the PBIM total scores and above acceptable levels for all subscales (see Table 3.9).

Table 3.9

Descriptive Statistics and Cronbach’s Alpha Values for the Six Subscales of the PBIM

Factor number	Factor name	No. of items	Cronbach’s alpha	Mean (SD)	Min-Max
1	Total score	37	.86	176.26 (20.60)	103-243
2	Signs and symptoms of brain injury	12	.83	62.67 (9.72)	26-84
3	Social determinants and consequences of brain injury	4	.71	17.01 (4.19)	4-28
4	Severity and impact of brain injury	6	.74	30.13 (5.21)	13-42
5	Insight	6	.71	27.77 (5.10)	13-42
6	Permanence of brain injury	4	.64	17.68 (3.77)	8-27
7	Physical and medical Expectations	5	.63	21.00 (4.57)	7-35

3.10.5 Stage 1: Item Screening of the BIAS

Initial screening for the 77-item pool of the BIAS followed the same process as the PBIM. The criteria for item removal were: (1) mean values above 6, indicating a potential ceiling effect; (2) less than 5% frequency of responses below the mid-point, and (3) a correlation above .3 with SDS scores (see Appendix J). In this initial screening, 39 items were identified as candidates for removal. Of these 39 items, 23 had mean values above 6 and fewer than 5% of responses below the mid-point; 13 items had fewer than 5% of responses below the mid-point; and three items had mean values above 6 (see Table 3.10 for example exclusions). As with the PBIM, no items were removed due to correlations above .3 with the SDS scores. The remaining 38 items were entered into an exploratory factor analysis.

Table 3.10

Example Items Excluded from the BIAS after Initial Item Screening

Item	Mean	Correlation with SDS	% Of responses in the reverse direction
People with brain injury deserve understanding from those around them (P)	6.25	.015	2%
I feel sorry for people with brain injury (P)	5.74	.009	3.5%
I would not knowingly be friends with a person with brain injury (N)	6.12	.045	5.75%

3.10.6 Stage 2: Initial Exploratory Factor Analysis of 38 BIAS items

A principal axis factor analysis was conducted to extract factors using oblique rotation (direct oblimin). The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.89 and Bartlett's Test for Sphericity was significant (p <.001), demonstrating good factorability.

Initial analysis using Principal Axis Factoring revealed 11 factors with eigenvalues above 1, which explained 59.4 1% of the total variance. Scree plot examination revealed two possible solutions of three and five factors. Both solutions were examined to identify the better fit when considering both statistical and conceptual factors. Loadings beneath .4 were suppressed at this stage and overall, the five-factor solution was deemed the most appropriate fit. However, only 21 items had primary loadings of .4 and above (see Table 3.11), meaning that the remaining 17 items were excluded after factor extraction. The item *'There is no need to be frightened of people with brain injury'* loaded across factors 1 and 5 but was retained in factor 1 where it had a higher loading. Further, factor 4 was deemed to be an unstable factor as it only had two items – '*I would have a strong urge to help someone with a brain injury,'* and *'people with brain injury can be trusted to tell the truth about the severity of their symptoms'.* However, the first item also loaded against Factor 2 and was subsequently retained there owing to its conceptual fit. In contrast, the second item was eliminated as it did not load across any other factor.

Table 3.11

Factor Loadings Based on Principal Axis Factoring with Oblimin Rotation for 20-items of the BIAS

BIAS items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
I would feel unsure about mixing and interacting with someone with a brain injury	0.795				
I would feel reluctant to strike up a conversation with someone with a brain injury	0.685				
If I were a landlord, I would be reluctant to rent my house to a person with brain injury	0.519				
Meeting someone with a brain injury wouldn't scare or frighten me	0.474				
I would feel uncomfortable being friends with a person who has a brain injury	0.46				
There is no need to be frightened of people with brain injury	0.41				0.409
The misfortune of people with brain injury has no emotional effect on me		0.633			
The unhappiness or distress of a person with brain injury would not be especially moving for me		0.558			
I would find it upsetting to observe someone with a brain injury		0.543			
If I knew someone with a brain injury, I would not feel particularly worried or concerned for them		0.456			
Symptom exaggeration after brain injury is uncommon			0.632		
Typically, people with brain injury do not use their symptoms for personal benefit			0.552		
Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life'			0.526		

People commonly use their brain injury to excuse their general behaviour and manner			0.411		
People with brain injury can be trusted to tell the truth about the severity of their symptoms[a]				0.423[a]	
I would have a strong urge to help someone with a brain injury[b]		0.404[b]		0.406[b]	
People with brain injury pose no risk to other people					0.689
People with brain injury are dangerous and pose a risk to society					0.61
People with brain injury are no more dangerous than anyone else					0.597
People with brain injury are unlikely to be a danger to themselves or others					0.526
People with brain injury pose a threat to others					0.522
Eigenvalues	8.61	2.35	1.74	1.70	1.48
% Variance	22.67%	6.17%	4.57%	4.48%	3.9%

Note: [a]removed from scale [b]retained in factor 2

Therefore, 20 items were retained at the end of this process which fell across four distinct factors: (1) Social inclusion (six items); (2) Empathy (five items); (3) ‘Genuineness’ (four items), and (4) ‘Risk and dangerousness’ (five items). The internal consistency of the BIAS was excellent overall, with subscales also exceeding acceptable thresholds (see Table 3.12).

Table 3.12

Cronbach's Alpha Values and Descriptive Statistics for each Factor in the BIAS

Factor number	Factor name	No. of items	Cronbach’s alpha	Mean (SD)	Min-Max
1	BIAS total	20	.84	106.21 (13.76)	65-137
2	Social inclusion	6	.77	33.96 (5.77)	12-42
3	Empathy	5	.65	26.69 (4.44)	13-35
4	Genuineness	4	.72	21.04 (4.01)	8-28
5	Risk and dangerousness	5	.74	24.53 (4.79)	12-35

3.10.7 Correlations between PBIM and BIAS Scores

As the BIAS and PBIM have been subjected to psychometric evaluation, the data were treated as interval level. P-P plots indicated that the data were approximately normally distributed. Inspection of a scatterplot revealed a linear relationship between PBIM and BIAS total scores and an even spread of scores, indicating that the assumptions of Linearity and Homoscedasticity were met (see Figure 3.1).

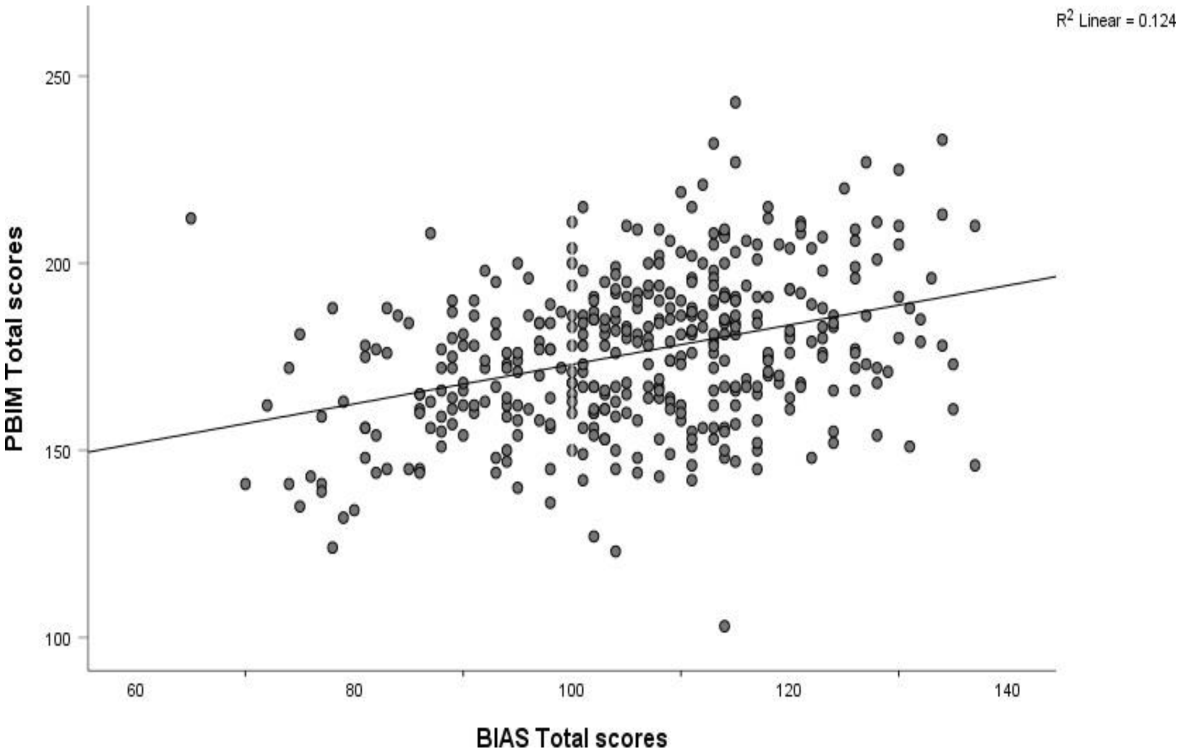

Figure 3.1 *Scatterplot of the Relationship between PBIM and BIAS Total Scores*

As anticipated, a significant positive relationship between total PBIM and BIAS scores was found, *r* (388) = .35, *p* <.001 (one-tailed); as knowledge levels about brain injury increased, attitudes towards individuals with brain injury also increased (i.e., more positive attitudes).

3.10.8 Exploration of Proximity to Brain Injury in Relation to PBIM Total and Subscale Scores

To examine the relationship between the LOC rank scores and PBIM total scores, a spearman's rho correlation coefficient was conducted. A non-parametric test was used as the LOC ranked data was ordinal. The relationship between LOC ranks and PBIM total scores was not statistically significant, r_s = .062, *p* = .62 (one-tailed), indicating that proximity to brain injury was not associated with more accurate knowledge.

Next, a one-way between subjects ANOVA was conducted to compare PBIM scores (see Table 3.13) across the three LOC 'level of proximity' groups (Low, Medium, High).

Table 3.13

Means and Standard Deviations for PBIM Total Scores – Total Sample and by LOC Group Status

	N (%)	**PBIM total score Mean (SD)**
Total sample	400 (100%)	176.26 (20.60)
Low LOC	236 (59%)	174.88 (20.17)
Medium LOC	53 (13.25%)	175.87 (21.83)
High LOC	111 (27.75%)	179.38 (20.75)

Note: Low = ranks 1-4, Medium = LOC ranks 5-8, High = LOC ranks 9-12

The Levene's test for equality of variance was non-significant, F (2, 397) =.118, p=.889, indicating that the homogeneity of variance assumption was met. However, PBIM total scores did not statistically differ across the three 'level of proximity' groups (Low, Medium, High), F (2, 397) = 1.82, p = .16, $\eta p^{2} =$ .01.

PBIM subscale scores were also examined across the 'level of proximity' groups (Low, Medium and High LOC scores). To control for familywise error, a Bonferroni correction was applied (0.05/6; $p < .008$). Levene's test of equality of variance was non-significant (p>.05) for five subscales but was significant for 'Severity and impact of brain injury' (p<.05). Consequently, Welch's F (Welch, 1951) was used for the latter subscale due to its robustness against violations of homogeneity of variance (Field, 2018). One-way between subject ANOVAs revealed no statistically significant differences between LOC ‘level of proximity’ groups on any of the subscales (see Table 3.14). Therefore, there was no evidence that knowledge (PBIM total and subscale scores) was impacted by participants’ previous proximity to brain injury.

Table 3.14

Means, Standard Deviations, and One-Way Analyses of Variance: PBIM Subscales and LOC Levels of Proximity Scores

	Low		**Medium**		**High**		**One-way ANOVA**		
PBIM subscale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F* (2, 397)	*p*-value	ηp^2
Signs and symptoms of brain injury	62.00	9.44	61.38	9.79	64.71	10.07	3.52	.03	.02
Social determinants and consequences of brain injury	16.92	4.07	17.38	4.32	17.01	4.42	3.26	.77	.00
Severity and impact of brain injury	29.96	5.43	29.94	5.61	30.59	4.49	0.72[a]	.49	-
Insight	27.67	4.68	27.92	5.34	27.77	5.06	0.12	.89	.00
Permanence of brain injury	17.39	3.87	17.87	3.69	18.21	3.52	1.88	.15	.01
Physical and medical expectations	20.94	4.58	21.38	4.36	20.94	4.68	0.21	.81	.00

Note: [a]Welch's *F (*2, 134.28)

3.10.9 Exploration of Proximity to Brain Injury in Relation to BIAS Total and Subscale Scores

In contrast to expectations, the relationship between LOC ranks and BIAS total scores was not statistically significant, r_s = .077, *p*=.61 (one-tailed). That is, BIAS total scores did not increase as levels of proximity increased.

Next, BIAS scores were also compared between the Low, Medium and High LOC 'level of proximity' groups (see Table 3.15 for descriptive statistics).

Table 3.15

Means and Standard Deviations for BIAS Total Scores – Total Sample and by LOC Group Status

	N (%)	**BIAS total score** **Mean (SD)**
Total sample	400 (100.00%)	106.21 (13.76)
Low LOC	236 (59.00%)	104.91 (13.87)
Medium LOC	53 (13.25%)	104.49 (13.39)
High LOC	111 (27.75%)	109.80 (13.16)

Note: Low = ranks 1-4, Medium = LOC ranks 5-8, High = LOC ranks 9-12

Levene's test for equality of variance was not statistically significant, *F* (2, 397) = .665, *p*=.52, indicating that the homogeneity of variance assumption was satisfied. A one-way between subjects ANOVA revealed that BIAS scores were significantly different between the three 'level of proximity' groups, *F* (2, 397) = 5.37, *p* = .005. Post hoc tests using Bonferroni-corrected alpha values (.05/3 = .017) revealed that the High contact group had significantly higher total BIAS scores than the Low contact group (*p*=.006). Pairwise comparisons revealed no statistically significant differences (*p* >.05) between the High and Medium groups, or between the Medium and Low groups[4].

Individual subscale scores were also examined to see if there were any differences between the three LOC 'level of proximity' groups on any of the BIAS subscales. As the four one-way ANOVAs conducted on the BIAS subscales were a family of tests, the overall *p*-value for the ANOVA was Bonferroni corrected (.05/4= .0125) to control the familywise error rate.

For the subscale 'Social Inclusion,' the Homogeneity of Variances assumption was met using Levene's test, F (2, 397) = .067, p=.94 and a significant main effect of 'level of proximity' on 'Social inclusion' scores was found (see Table 3.16). In line with BIAS total scores, post hoc tests using Bonferroni adjusted alpha values (0.05/3) revealed that the High group had significantly higher 'Social inclusion' scores than the Low group (p <.001). No other significant pairwise differences were found (p > .05).

The homogeneity of variances assumption was also met for the three remaining subscales (Empathy, F (2, 397) = 2.90, p=.056; Genuineness, F (2, 397) = 0.134, p=.88, and Risk and dangerousness, F (2, 397) = 0.125, p=.88). No significant differences between the 'level of proximity' groups on these subscales was found (see Table 3.16).

[4] Although the mean score for the Medium group is lower than for Low group, unequal group sizes contribute to the null effect between Medium and High contact groups as error bars (95%CI) are wide and overlap.

Table 3.16

Means, Standard Deviations, and One-Way Analyses of Variance in BIAS Subscales and LOC levels of proximity scores

	Low		Medium		High				
BIAS subscale	M	SD	M	SD	M	SD	**F(2, 397)**	**p-value**	**ηp^2**
Social inclusion	32.89	5.63	34.55	5.60	35.96	5.77	11.60	<.001	.06
Empathy	26.72	4.26	25.28	5.45	27.28	4.16	3.69	.03	.02
Genuineness	21.01	4.00	20.64	4.22	21.28	3.95	0.46	.63	.002
Risk and dangerousness	24.29	4.82	24.02	4.70	25.29	4.74	1.99	.14	.01

Overall, level of proximity to brain injury impacted overall BIAS scores, with participants reporting higher proximity to brain injury (e.g., a friend, relative or the participant themselves had a brain injury) demonstrating more positive attitudes towards individuals with brain injury. However, further analyses of subscale scores showed that this pattern was only upheld for the Social inclusion subscale, suggesting that this subscale was driving the overall main effect.

3.11 Discussion

3.11.1 Item Development and Scale Construction

As a 'gold standard' instrument to measure perceptions of brain injury is currently lacking (see Chapter 2), the aim of these first two phases of scale development was to address some of the limitations with existing measures. The initial focus for item generation was to revisit the scope and coverage of existing measures of brain injury perceptions. Existing evaluations of brain injury measures have also almost exclusively focussed on measuring knowledge of brain injury (e.g., Gouvier et., 1988; Springer et al., 1997) at the expense of considering broader contextual factors, including social evaluations and attitudes towards individuals with brain injury. Whilst earlier measures were devised from clinical observations of the misconceptions commonly expressed by members of the general public (e.g., Gouvier et al., 1988; Springer et al., 1997), newer measures have moved towards focusing on the functional consequences of brain injury (e.g., Ono et al., 2015). However, problematic to both approaches has been the lack of an overarching conceptual framework, whereby measures have predominantly focussed on factual understanding of brain injury.

Thus, this study sought to address this limitation by adopting a conceptually driven approach to development using a 'biopsychosocial' framework (WHO, 2002). This approach facilitated the development of new perception items that tapped into the many layers of brain injury disability. In essence, this framework seeks to understand the individual and their disability from multiple perspectives, starting with *impairments* (e.g., what the core symptoms are for the individual), how these then impact *activities* (e.g., how do the impairments affect the individual), and in turn, their impact on *participation* (e.g., the barriers these create in social environments). This framework also considers the individual in their wider social context and how *environmental factors* (e.g., societal attitudes) impacts the individual. This approach led to the development of two distinct constructs pertaining to 'knowledge-based' and 'attitude-based' perceptions, which in turn, informed the development of two distinct item pools.

The first item pool, which later became the 'Perceptions of Brain Injury' (PBIM) scale, focused on knowledge-based perceptions. In line with the ICF framework (WHO, 2002), items encompassed perceptions of causes of brain injury (e.g., concussion, types of injuries), impairments associated with brain injury (e.g., poorer decision making, memory), activities that can be affected by brain injury (e.g., joining in group conversations, responding to social cues), and societal participation (e.g., returning to work, increased risk of homelessness). Thus, items mapped across multiple domains (e.g., social consequence, behavioural control, and responsibility). Then, items which did not sufficiently capture knowledge of brain injury were subsequently removed following analysis of responses by a group of 'expert judges' (i.e., professionals working in the field of brain injury).

The second pool of items developed focussed on contextual factors, and specifically, the environment and social context that an individual with brain injury inhabits (see WHO, 2002). Thus, these items were developed to explore attitude- based perceptions towards brain injury. Rather than focusing on existing scales of brain injury, the approach here was to draw from other literature sources (e.g., the mental health literature; see P. Corrigan et al., 2003) to facilitate item generation and focus on new untapped perceptions such as 'Empathy' and 'Social Inclusion.' In total, 77 items were generated which mapped across to multiple domains, and this later became the 'Brain Injury Awareness Scale' (BIAS).

A second consideration integral to the development process was 'end use,' and specifically, the need to adopt a consistent response scale that would allow total and subscale scores to be calculated. This contrasts the approach commonly taken with existing measures (e.g., Hux et al., 2006), which have tended to draw conclusions based on individual items and also to dichotomise participant responses as either 'true' or false'. Consequently, drawing firm conclusions about perceptions and misconceptions of brain injury from previous research is problematic (see Chapter 2). For example, uncertain responses have frequently been treated in the same way as certain responses (e.g., Gouvier et al., 1988), meaning that a full and accurate picture of misconceptions and perceptions of brain injury is potentially still lacking. To address these two issues, and to develop research and understanding in this field, a 7-point scale was therefore adopted for both measures (although different scale points were used). The overarching goal was to create more sensitive, nuanced, and accurate measures to evaluate brain injury perceptions (see Finstad, 2010).

3.11.2 Factor Analysis and Internal Consistency

The next stage of development focused on examining the construct validity and internal consistency of both measures. For the PBIM, a finalised 37-item measure assessing knowledge of brain injury was developed and subjected to psychometric analysis in a general population sample. Exploratory factor analysis revealed the presence of six underlying factors: (1) Symptoms of brain injury: (2) Social determinants and Consequences of brain injury; (3) Severity and impact of brain injury (4) Insight; (5) Permanence of brain injury, and (6) Physical and medical expectations. Two of these PBIM factors show some commonalities with previous misconception measures; namely the ‘Symptoms of brain injury’ and ‘Insight’ factors share some common themes to the ‘Brain Injury Sequelae’ and ‘Insight’ factors from the CM-TBI-20 (see Linden et al., 2013). However, two novel factors - ‘Associated vulnerabilities’ and ‘Physical and medical expectations’ - led to an expanded conceptualisation of knowledge-perceptions. Internal consistency for the PBIM was good, with acceptable consistency for four of the six subscales. For the final two subscales, ‘Permanence of brain injury’ and ‘Physical and medical expectations,’ internal consistency was somewhat lower, though still in the range considered ‘adequate’ for early exploratory research (Nunnally, 1978). Further, previous misconception measures vary widely in their internal consistency, (Hux et al., 2006; Pappadis et al., 201; Ono et al, 2011; Matthew & Jobse, 2015). Consequently, the internal consistency of the 37-item PBIM represents an improvement over existing measures. The BIAS was also subjected to factor analysis, and a final 20-item four factor structure was revealed: (1) Social inclusion; (2) Empathy; (3) Genuineness; and (4) Risk and dangerousness. As with the PBIM, internal consistency for the overall BIAS score was ‘good,’ albeit with subscales showing slightly lower values.

3.11.3 Construct Validity

It has already been acknowledged that an ideal instrument has not previously been developed (see Chapter 2), and therefore no ‘gold standard’ brain injury perception measure exists to examine convergent validity. Thus, the relationship between BIAS and PBIM scores were used to explore this and to further validate both scales. A moderate positive relationship was found between measures; more accurate knowledge of brain injury was associated with more positive attitudes. Although, whilst this finding provides some early indication that the convergent validity of both the PBIM and BIAS are good, a more thorough exploration may be required. In contrast, divergent validity was evaluated using SDS scores, as it would be expected that valid items from both the PBIM and BIAS would be unrelated to socially biased responding. This is often an under evaluated threat to construct validity in scale development research (see King & Bruner, 2000) and promisingly, no meaningful correlations between SDS scores and any of the PBIM or BIAS items were found. Thus, these early findings provide promising results for the convergent and divergent validity of the PBIM and BIAS.

Frequently neglected in misconception research, understanding a participant's familiarity and exposure to brain injury is also important. Block et al. (2016) found that 27% of respondents obtained brain injury knowledge from documentaries, aligning to previous findings indicating that TBI knowledge mostly comes from media sources (Block et al., 2014). For the PBIM, it was expected that individuals with higher levels of proximity to brain injury (i.e., those who had friends of family with a brain injury) would evidence more accurate knowledge. However, no significant relationships were found between PBIM and LOC scores. Generally, little attention has been paid to the effect of familiarity and exposure to brain injury on knowledge-based perceptions, although early research by Gouvier et al.'s (1988) showed that knowledge-based perceptions were not impacted by source of information (e.g., media, personal contact with TBI). Even so, it is important to try and understand why greater familiarity with, and exposure to, brain injury does not necessarily lead to more accurate knowledge. It could be because the LOC does not examine the quality of the relationships in work settings (for medium proximity groups) or with family/friends (for high proximity groups). For example, whilst an individual may work with someone with brain injury, this could be in passing or infrequently. Alternatively, a family member who is distant to the participant may have sustained a brain injury, but they might not have regular contact with that individual. Therefore, the LOC (see Holmes et al., 1999) may fail to appropriately capture differences in relationship quality. Further research is needed to determine if a knowledge framework (i.e., formal training or education) is needed to understand and interpret the experience of brain injury. Consistent with prior research (e.g., McKendry et al., 2014), collecting data from a professional group may help establish the sensitivity of the PBIM in detecting differences in knowledge levels of brain injury.

Conversely, more positive attitudes on the BIAS (total scores) were associated with higher levels of proximity, although this was driven by a single subscale - social inclusion. Previous research has also explored the effect familiarity of brain injury on attitudes. Irwin and Fortune (2014) found that, amongst 14- to 17- year-old children, knowing someone with a brain injury was not related to more positive attitudes. Whilst such findings contrast those reported here, sampling differences and variations in what the constructs are measuring may explain some of these differences. However, when focusing on other invisible disabilities, namely mental illness (MI) and intellectual disability, proximity was related to higher 'Benevolence' scores and lower 'Social Restrictiveness' scores (Irwin & Fortune, 2014). This latter finding in relation to MI is consistent with previous research, whereby respondents familiar with MI held higher positive attitudes (i.e., indicated more willingness to help, more pity) and lower negative attitudes (i.e., less fear and likelihood of avoidance) than participants with low familiarity (e.g., P. Corrigan et al., 2003). However, a review of evidence on the effect of familiarity on attitudes towards MI has reported mixed findings (see Schulz, 2007).

3.11.4 Limitations

The current study is not without limitations. First, the main challenge in developing the PBIM was in identifying latent constructs. In the first attempt at factor analysis, one large dominant factor was found whereby items seemed conceptually unrelated and potentially grouped by virtue of response set. With the latter, it was noted that all items were reverse scored and thus, the way in which items were worded was potentially influencing why these items were clustering together. Additionally, using a mixture of 'true' and 'false' items has been recommended for new brain injury perception measures to avoid response bias (Block et al., 2016) and reverse scoring of items is commonly adopted in scale construction to avoid acquiescence bias (see Boateng et al., 2018). However, some researchers argue that for complex constructs, reverse scoring may negatively impact responses (Frey, 2018; Swain et al., 2008). Indeed, as TBI is often considered an invisible disability (see McClure, 2011) where the emotional, cognitive, and behavioural consequences are often hidden, participants may not have previously considered the items under evaluation. Thus, underlying latent constructs may be harder to capture in a sample drawn from the general population, than for example, in a professional sample who would be likely to respond differently to the item sets. Thus, whilst the overarching 'biopsychosocial' conceptual framework was implemented to capture the complexity of TBI disability, the scoring system may have led to the initial difficulties in the early stages of factor analysis of the PBIM. As a result, a further step in screening was implemented, namely lowering the item mean value threshold to 5.5, to further reduce the PBIM item set which led to a suitable six-factor structure being established.

3.11.5 Conclusions

This Chapter sought to develop and evaluate novel perception measures of brain injury. A ‘biopsychosocial’ framework was adopted to capture the complexity of TBI disability and to facilitate item development. Phase one focused on domain and item development, resulting in the generation of two distinct items pools which differed in terms of their conceptual focus – knowledge-based (PBIM) versus attitude-based (BIAS) perceptions of brain injury. Phase two focused on the further development and evaluation of the measures, including their psychometric properties. A process of item screening and exploratory factor analysis (EFA) was conducted, resulting in the 37-item (six-factor) PBIM, and the 20-item (four-factor) BIAS. Importantly, both measures demonstrated ‘good’ internal consistency for total scale scores, and at least ‘adequate’ for subscales (factor) scores. In sum, the PBIM and BIAS were both subjected to a rigorous approach to item development and psychometric testing, with positive early indicators of their reliability and validity.

Chapter 3: Key Messages

- Using a biopsychosocial framework to facilitate item generation, two new novel measures have been developed to tap into knowledge- and attitude-based perceptions of brain injury.
- Item screening and exploratory factor analysis reduced the initial large set of items to a 37- Perception of Brain Injury Measure (PBIM) and 20-item Brain Injury Awareness Scale (BIAS). Both demonstrated excellent internal consistency for total scores.
- Whilst early testing shows promising results for the PBIM and BIAS, further psychometric testing is needed to assess their temporal validity, determine if the PBIM can discriminate knowledge differences between lay and professional populations, and to confirm the factor structures reported here.

Chapter 4 Evaluation of the Perception of Brain Injury Measure (PBIM) and Brain Injury Awareness Scale (BIAS)

4.1 Chapter Overview

In Chapter 3, phases one and two of scale construction were outlined, with early indications showing promising results concerning the reliability and validity of the PBIM and BIAS. However, thorough psychometric testing should also include a third phase of scale construction prior to a measure's use in empirical research (see Boateng et al., 2018). Indeed, Boateng et al. (2018) argues that the third phase should involve: (1) testing scale dimensionality (i.e., testing a hypothesised scale structure); (2) measuring scale consistency (e.g., testing the reliability of scores over time), and (3) examining scale differentiation between 'known' groups (e.g., the scale demonstrates an expected difference between groups). Thus, subjecting newly developed measures to a third phase of psychometric testing serves to further strengthen the utility of measures for later use in applied research. Consequently, and in line with the recommendations set out by Boateng et al. (2018), the aim of this Chapter was to further evaluate the 'Perception of Brain Injury Scale (PBIM)' and 'Brain Injury Awareness Scale (BIAS)'. The process and steps involved in this evaluation are outlined in greater detail below.

4.2 Testing Scale Dimensionality

In respect to scale dimensionality, EFA is considered a data driven approach to examine relationships between variables (T.A. Brown & Moore, 2012) and is typically atheoretical. Thus, there is no strong *a priori* model or prediction of the likely relationships between observed variables or the number of factors present in the scale

(Flora et al., 2012; B. Williams et al., 2010). Confirming the proposed subscale structure in an independent sample using Confirmatory Factor Analysis (CFA) is a useful and important next step in scale construction research (Boateng et al., 2018).

However, prior research in the brain injury field has largely tended to use EFA to explore the underlying latent variables within a scale (e.g., Linden et al., 2013; Rosenbaum & Arnott, 2009;) without further confirmatory analysis. In other cases, CFA has been used to confirm a theoretically derived structure, such the HIKS proposed 'minimisation' and 'over-generalisation' constructs, without using EFA in the initial stages of research (see Thomas & Jobse, 2015). Consequently, findings from EFA in previous misconception scale research have largely been left unchecked despite its exploratory nature. Indeed, a review of existing measures revealed that only one published scale assessing perceptions of brain injury had used both EFA and CFA in scale development - the Perception of Brain Injury Survey (PBIS; Oyesanya et al., 2020). Thus, the first main aim of this Chapter was to use CFA to evaluate the findings from the EFA (Chapter 3) in order to further investigate the construct validity of the PBIM and BIAS.

4.2.1 Test-Retest Reliability

A valid and reliable scale should demonstrate stability in scoring over time - assuming, that is, that the construct under examination has not changed in the intervening interval. One method to examine stability is test-retest reliability, in which participants complete the same measure at two timepoints, and then the correlation between timepoints is examined (Morgado et al., 2018). Knowledge and attitudes are good candidates for test-retest reliability because they are generally considered stable constructs (Allport, 1935; Multon, 2012). For instance, even though knowledge and attitudes can change over the medium- and long-term as a function of experience and education (e.g., Zajonc, 1968), they are unlike mood, for example, which can fluctuate naturally from moment to moment (Multon, 2012). Even so, and despite its suitability as part of ongoing psychometric evaluation, test- retest reliability analysis has largely been overlooked as a means of measuring scale consistency over time in previously developed perception of brain injury measures.

Indeed, of the existing measures, only the Rosenbaum's Concussion Knowledge and Attitudes Survey-Student Version (RoCKAS-ST) has been subjected to test-retest reliability, with one of its subscales - the 'Concussion Knowledge Index (CKI)' - demonstrating inadequate stability when tested over a two-day interval (see Rosenbaum & Arnott, 2009). Whilst time between administrations should be sufficient to reduce the chance of practice effects, the two-day interval adopted with the RoCKAS-ST measure is generally considered too short, as participants may remember their previous responses (Multon, 2012; Polit, 2014). Conversely, longer intervals between administrations may increase the chances of a real change occurring, potentially causing a confounding factor (Multon, 2012). Therefore, the time interval between administrations needs careful consideration. Less than seven days is generally considered insufficient (Polit, 2014), with more widely accepted intervals in health research ranging from one to two weeks (e.g., Deyo et al., 1991; Multon 2012). Consequently, the second main aim of this Chapter was to further examine the psychometric properties of the PBIM and BIAS by: (1) conducting test- retest reliability of the PBIM and BIAS, and (2) using more widely accepted time intervals between administrations.

4.2.2 *Discriminant Validity*

Evaluating a measure's ability to differentiate between groups is important, especially when an observed difference is expected (Boateng et al., 2018). Differentiation can be evaluated when 'known groups' are included based on an a priori expectation about how they would respond to items within the measure (Boateng et al., 2018). In the case of the PBIM, it is anticipated that professional experts in the field of brain injury should score higher on the PBIM than a general population sample. Thus, if this is the case when the measure is evaluated, it allows a conclusion to be drawn that the measure can discriminate between known groups.

So far, evidence clearly indicates that misconceptions exist concerning the nature of, and recovery from, brain injury in the general population and non-expert health professionals (e.g., Hux et al., 2006; Oyesanya et al., 2016; Swift and Wilson, 2001). Furthermore, the key driver for early misconception research in this field came from clinical settings whereby professionals observed misconceptions amongst the public with regards to their knowledge and understanding of brain injury (Gouvier et al., 1988). Consequently, professionals working in the field of brain injury have been included in perceptions of brain injury research in different ways. For instance, professionals have evaluated the accuracy of knowledge-based scale items (e.g., Willer et al., 1993), but have also been used in validity testing to assess scale differentiation (e.g., McKendry et al., 2014). Thus, psychometric evaluation of brain injury perception measures has used both professional samples and lay population samples to test the sensitivity of measures (e.g., McKendry et al., 2014). Arguably, knowledge-based brain injury measures should be able to detect knowledge differences between lay and professional samples, with an expectation that more accurate knowledge of brain injury would be observed in a professional sample.

In alignment with this view, professionals (recruited from disability and mental health specialists work settings) demonstrated higher levels knowledge than a lay sample on the Brain Injury and Schizophrenia Awareness Scale (BISAS), a tool to measure knowledge of the individual and shared effects of schizophrenia and TBI (McKendry et al., 2014). However, this differentiation was only found for items that covered the shared effects of schizophrenia and TBI. That is, professionals did not show higher levels of knowledge for symptoms specifically associated with either TBI or schizophrenia in isolation (see McKendry et al., 2014), thereby raising significant doubts about the sensitivity of the tool.

In Chapter 3, group differences for the PBIM and BIAS were investigated within a general population sample, who were categorised into three groups based on their level of contact with those with brain injury, namely: High, Medium, or Low levels of contact (LOC; see Holmes et al., 1999). However, PBIM scores did not differ across LOC groups. This finding appears to be consistent with other general population research which also failed to demonstrate a relationship between knowledge of, and level of proximity to, brain injury (e.g., Gouvier et al., 1988). The lack of differences across groups could be attributable, at least in part, to lack of information pertaining to the quality of proximity and familiarity (for example how close/ distant a relative contact with brain injury may be) provided by the LOC measure. Thus, recruiting a sample which is known to have close contact with brain injury (i.e., a professional sample) provides a more convincing way to investigate the validity of the PBIM. Therefore, the third main aim of this Chapter was to examine PBIM's ability to distinguish between a lay and professional sample, with an expectation that knowledge levels (PBIM scores) would be higher in the professional sample.

4.2.3 *Summary and Aims*

In sum, the overarching aim of this third phase of scale evaluation was to implement a rigorous and comprehensive set of psychometric tests to further scrutinise the reliability and validity of the PBIM and BIAS measures. Specifically, three specific methods of scrutinising reliability and validity were implemented to: (1) confirm the theorised model of the factor sub-structures for the PBIM and BIAS outlined in Chapter 4 in a new general population sample (see T. A. Brown, 2015); (2) examine the test-retest reliability of total and subscale scores for both the PBIM and BIAS, and (3) explore the discriminatory value of the PBIM, specifically testing whether PBIM scores discriminate between professional and lay members of the general population. The sensitivity of the BIAS measure to detect differences between professionals and laypersons is not included in this Chapter, given that evidence drawn from mental health contexts indicates that professionals may not necessarily hold more positive attitudes than laypersons (Wahl & Aroesty-Cohen, 2010). Rather, exploratory analysis of professional and laypersons attitude-based perceptions will be covered in Chapter 5. Importantly, whilst other perception of brain injury measures may have employed one of these methods to evaluate scale reliability and validity, no existing scales have been subjected to all three.

4.3 Methods

4.3.1 Participants

Two samples were recruited for this study, one to represent a lay population (i.e., non-experts in the field of brain injury) and the second to represent a professional sample (i.e., professionals with experience of working in the field of brain injury). Eligibility criteria for both samples required participants to be over 18 years of age.

4.3.1.1 Lay population sample

For the lay population sample, two independent general adult (i.e., over 18 years of age) population samples were collected through: (1) Prolific (www.prolific.co) and (2) Swansea University and the researcher's (EB) own social networks. For the Prolific sample, the study 'Development of a Perception of Brain Injury Measure' was advertised through their own site and participants were paid £1.25 for participating. These participants only completed the survey once. These participants were also pre-screened through the Prolific site to make sure they met the following eligibility criteria: (1) First language English; (2) a minimum age of 18; (3) minimum approval rating of 90%, and (4) had not participated in any the previous research on this theme and/or by the principal researcher (EB).

For the second sample (i.e., recruited through Swansea University and researcher's social networks), participants were invited to complete the study 'Development of a Perception of Brain Injury Measure' twice, so that test-retest reliability could be examined. Participants in this sample were informed that there would be an approximate two-week interval between participating in the first and second sessions. This group of participants were recruited through a combination of (1) university-based adverts (including poster advertising and email distributions to staff and students) in exchange for either a payment of £5.00, study swaps (i.e., the researcher contributed to the participant's own research), or Psychology Department participant pool credits; and (2) from one of the researcher's (EB) own social networks, who were not compensated for participating.

For the lay population sample, a total sample of 211 participants were recruited. Most of this sample was recruited through Prolific (n = 150) with the remainder recruited through social networks and the Swansea university student and staff community (n= 61). Participants (n = 12) were excluded if they failed any (i.e., one or more) attentional control checks that were embedded in the PBIM and BIAS questionnaires. This left a final sample of 199 participants for data analysis, of whom 121 (60.8%) were female. Ages ranged between 18 and 76 years (*M* = 34.43, *SD* = 12.87). See Table 4.1 for further demographic information.

Of these 199 participants, 47 completed both parts of the study (sessions 1 and 2), which exceeds minimum sample size requirements (n = 22) for conducting test-retest reliability analysis, when power is 80% and $p<.05$, so that an intra-class correlation (ICC) values of at least .05 can be detected (see Bujang & Baharum, 2017). The interval between administrations ranged from 12 – 16 days, with this approximate two-week interval falling into an acceptable range (e.g., Polit, 2014). The test-retest reliability sample (n= 47) were aged between 22-69 years (*M* = 36.98, *SD* = 14.68), and 30 (63.8%) participants were female.

4.3.1.2 Professional Sample

For the professional sample, study invitations were distributed primarily by email to professionals working in the field of brain injury, with contacts provided by two members of the research team (CW and AW). Participants were invited to participate in a study called ‘Development of a Perception of Brain Injury Measure’ and/or were encouraged to distribute the study information to others who may have been interested in participating. Information about the study was also advertised via social media networks. Additional eligibility criteria required these participants to be currently or previously working professionally in the field of brain injury. A ‘yes/no’ screening question asked participants to confirm that they were currently, or had previously, worked with individuals who had sustained a brain injury prior to accessing the study.

In total, 84 professionals completed the study. However, eight were excluded for failing at least one of the attentional control checks that were embedded in the PBIM and BIAS. This left 76 professional participants in the analyses.[5] Two of these participants did not complete the PBIM, and therefore data for a sub-set of n= 74 professional participants are presented here. Of these, 59 (79.7 %) were female and ages ranged between 21 and 64 years (*M* = 42.36, *SD* = 11.58). See Table 4.1 for further demographic information.

[5] Not all participants recruited for the professional sample completed both the PBIM and BIAS questionnaires. Therefore, participants were still included in the study if that had fully completed either of these measures. Therefore, for data analysis 74 participants completed the PBIM and 75 participants completed the BIAS (see Chapter 6 for analysis conducted with the BIAS).

Table 4.1

Summary of Demographic Characteristics for the Lay population and Professional Sample

Demographic characteristics	Lay population sample (n = 199)		Professional sample (n = 74[a])		Test-retest sample (n = 47)	
	n	*%*	*n*	*%*	*n*	*%*
Gender						
Male	75	37.7%	15	20.3%	17	36.2%
Female	121	60.8%	59	79.7%	30	63.8%
Other gender identity	2	1%	-	-	-	-
Prefer not to say	1	0.5%	-	-	-	-
Ethnicity						
White	169	84.9%	69	93.%	36	76.6%
Multiple ethnic groups	4	2%	1	1.4%	1	2.1%
Asian	12	6%	1	1.4%	3	6.4%
Black	7	3.5%	1	1.4%	1	2.1%
Latino/Hispanic	1	0.5%	1	1.4%	1	2.1%
Middle Eastern	2	1%	1	1.4%	2	4.3%
White/ Sephardic Jew	2	1%	-	-	2	4.3%
Other or prefer not to say	2	1%	-	-	1	2.1%
Educational attainment						
Secondary School	19	9.5%	4	5.4%	2	4.3%
Sixth form/ college	50	25.1%	4	5.4%	5	10.6%
First degree	88	44.2%	28	37.8%	21	44.7%
Master’s degree	32	16.1%	17	23.0%	15	31.9%
PhD/ Doctorate	7	3.5%	18	24.3%	2	4.3%
Other	3	1.5%	3	4.1%	2	4.3%

Employment status						
Full time employment	95	47.7%	57	77.0%	15	31.9%
Part-time employment	26	13.1%	15	20.3%	10	21.3%
Retired	7	3.5%	-	-	2	4.3%
Unpaid carer	8	4%	-	-	1	2.1%
Not working due to disability/ health reasons	5	2.5%	-	-	-	-
Actively seeking employment	10	5%	1	1.4%	-	-
Volunteer	2	1%	1	1.4%	-	-
Full time student	45	22.6%	-	-	19	40.4
Part-time student	1	0.5%	-	-	-	-
Country of residence						
Australia	4	2%	2	2.7%	45	95.7%
Canada	6	3%	1	1.4%	-	-
Ireland	1	0.5%	-	-	-	-
India	1	0.5%	-	-	1	2.1%
Mexico	-	-	1	1.3%	-	-
Netherlands	-	-	1	1.3%	-	-
Nigeria	1	0.5%	-	-	1	2.1%
United Kingdom	177	88.9%	69	93.2%	-	-
USA	9	4.5%	-	-	-	-

Note: [a]Data presented for the subset of participants who completed the PBIM

For the professional sample (n = 74), participants came from a wide range of professional backgrounds, including Consultant Psychologist (n= 12, 16.2 %), Clinical

Psychologist (n = 5, 6.8 %), Occupational Therapists (n = 6, 8.1%), and Case Managers (n = 10, 13.5%). These participants worked in a range of settings, including inpatient neurorehabilitation (n = 26, 35.1%), community-based rehabilitation (n = 23, 31.1%), charitable organisations (n =8, 10.8%), and academia (n = 2, 2.7%). See Table 4.2 for length of time in their roles and overall time spent working in the field (See Appendix K for full breakdown of professional backgrounds).

Table 4.2

Professional Experience – Years Working in Role and Field of Brain Injury

	Years in current role	**Years working in field**
Under 1 year	11 (14.9%)	4 (5.4%)
1 – 5 years	29 (39.2%)	21 (28.4 %)
6 – 15 years	28 (37.8%)	30 (40.5%)
16 – 25 years	4 (5.4%)	15 (20.3%)
Over 25 years	2 (2.7 %)	4 (5.4%)

4.3.2 Design

This study adopted a questionnaire-based research design to evaluate the reliability and validity of the 37-item PBIM and 20-item BIAS. As in the previous study (see Chapter 3), the adapted version of the Level-of-Contact report (LOC; Holmes et al., 1999) and the Marlowe-Crowne Social Desirability Scale (SDS; Crowne & Marlowe, 1960) were also used.

4.3.3 Materials

Four measures were included in this study. These were 37-item PBIM and 20-item for the BIAS, as well as the 12-item LOC (see Holmes, et al., 1999) and 33-item SDS (Crowne & Marlowe, 1960). See Chapter 3, section 3.9.3.4 for a full description of all these measures.

4.3.4 Additional Questions for the Professional Sample

In addition, participants from the professional sample were asked questions relating to their professional role and experience in the field of brain injury. These questions included: (1) primary occupation (e.g., psychologist, speech and language therapist); (2) other relevant professional roles that participants may have; (3) work setting (e.g., inpatient neurorehabilitation); (4) time they had been in their current role (e.g., years and months), and (5) overall timeframe working in the field of brain injury (e.g., years and months).

To aid with comparisons between the professional and lay population in terms of education, a new 'Years of Education' variable was computed based on responses to 'Educational Attainment.' Participants' years of education were approximated based on their highest level of education (e.g., a response of 'Secondary/ High school = 12 years and College/ Sixth form = 14 years; assuming a starting school age of 4 years). Mean 'Years of Education' was 17.74 (*SD* = 2.34) for Professionals and 16.09 (*SD* = 2.15) for Laypersons.

4.3.5 Procedure

Ethical approval was granted by Swansea University, Department of Psychology Research Ethics Committee (reference: 0338; Appendix G). The study was conducted through the online survey platform Qualtrics. The study was advertised to participants as 'Development of a Perception of Brain Injury Measure.' All participants were first informed that the aim of the study was to develop and validate two new perception of brain injury measures, pertaining to knowledge of, and attitudes towards, brain injury.

On clicking through to the study, participants were first presented with an information page which outlined the purpose of the research, what would happen to them if they took part, and relevant data protection and confidentiality arrangements. Participants were also informed that completion time would vary depending on their study arm but would fall between 15 and 30 minutes. The information page was followed by a consent page where participants could select ‘yes’ in a check box to electronically consent to take part in the study. Selecting ‘no’ led to study termination.

Depending on recruitment sample, participants were then asked to either create a unique identifier or to enter their Prolific ID (a requirement of the platform) and were informed that they would need to supply this should they subsequently decide to withdraw their data from the study. For those taking part in the study twice (sessions 1 and 2) for test-retest reliability purposes, it was also explained that this identifier would be required for the follow-up study so that participants’ data could be matched across the two sessions. All participants were then presented with standard demographic questions and professional questions (see Appendix Hand Appendix L) as applicable, followed by the LOC. Participants then completed the SDS, the 37- item PBIM and 20-item BIAS – which were presented in a counterbalanced order.

Items within the SDS, 37-item PBIM and 20-item BIAS were randomised, whereas items within the LOC were presented in a fixed order. A shortened version of the study was presented at the second session for participants (lay sample) recruited for test-retest reliability analysis. For session 2, participants were only required to answer two demographic questions (age and gender) in case further checks were needed to match data, followed by the 37-item PBIM and 20-item BIAS which were also presented in a counterbalanced order, and items were randomised in their order of presentation. Forced responding was used throughout to avoid missing responses/values. At the end of the survey, all participants were presented with an identical debrief form outlining how their responses would help validate the two new perception measures, as well as the contact details for the researchers.

4.4 Results

4.4.1 Initial Item Screening and Descriptive Statistics for the PBIM and BIAS

The first stage of data analysis was to evaluate the proposed factor structures of the PBIM, and BIAS identified in Chapter 3, using the lay population sample to replicate the same sampling parameters used for EFA. First, total scores and subscale scores were calculated for the PBIM based on the factors identified in Chapter 3. From a possible range of 37-259, PBIM total scores ranged from 132 – 243 (*M* = 172.01, *SD*= 18.41), whereas BIAS total scores ranged from 74- 137 (*M* = 103.42, *SD* = 12.31) from a possible range of 20-140. In terms of distribution of the data, skewness, and kurtosis statistic scores for the PBIM total were .53 and .80 respectively (see Table 4.3). For the BIAS total scores, skewness and kurtosis statistics scores were .13 and -.29 respectively (see Table 4.4). Therefore, as skewness and kurtosis statistics were shown to be within acceptable parameters (-2 to +2; George and Mallory, 2010) for both total and subscale PBIM and BIAS scores, the data was considered normally distributed. Descriptive statistics for the subscale scores for both the PBIM and BIAS are presented in Tables 4.3 and 4.4

Table 4.3

Lay Population Sample: Descriptive Statistics for the Proposed Six Factor PBIM Model

Factor name	No. of items	Mean (SD)	Min - max	Skewness statistic	Kurtosis statistic
1. Signs and symptoms of brain injury	12	62.25 (8.30)	36-84	.01	.05
2. Social determinants and consequences of brain injury	4	16.31 (4.30)	4-28	-.42	.55
3. Severity and impact of brain injury	6	29.57 (4.51)	16-42	.28	.31
4. Insight	6	26.89 (5.60)	9-42	-.25	.19
5. Permanence of brain injury	4	16.16 (3.11)	8-26	.20	.23
6. Physical and medical expectations	5	20.83 (4.70)	11-34	.55	.26

Table 4.4

Lay Population Sample: Descriptive Statistics for the Proposed Four-Factor BIAS Model

Factor name	No. of items	Mean (SD)	Min-max	Skewness statistic	Kurtosis statistic
1. Social inclusion	6	32.94 (5.65)	19-42	-.47	-.59
2. Empathy	5	26.42 (3.98)	15-35	-.13	-.12
3. Genuineness	4	20.71 (4.03)	8-28	-.34	-.06
4. Risk and dangerousness	5	23.35 (12.31)	12-35	.13	-.29

Individual items from the PBIM and BIAS were also screened for potential social desirability bias by correlating items with the SDS (see Appendix M). None of these correlations were above the 0.3 threshold (moderate correlation; Cohen, 1988) set in the previous study (see Chapter 3), suggesting items were not susceptible to socially biased responding. Consequently, no further items were excluded at this stage prior to CFA.

4.4.2 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted on the data obtained from the lay population sample. The proposed factor structures identified for the PBIM and BIAS in Chapter 3 were tested, using the maximum likelihood model (ML) and Lavaan package (Rosseel, 2012) for R. The chi squared values for both scales were significant ($p < .001$), indicating that the proposed factor structures of the PBIM and BIAS did not fit the data well. Subsequently, other Goodness-of-Fit Indices were examined, including the Root Mean Square Error of Approximation (RMSEA), the Standardised Room Mean Square Residual (SRMR), the Comparative Fit Index (CFI), and the Tucker- Lewis Index (TLI; see Table 4.5 for parameters indicating a good fit). Observing the same pattern as for the ML model, all were shown to be outside of the acceptable parameters for the hypothesised model for the BIAS (see Table 4.5). For the PBIM, only the RMSEA value showed a 'fair' fit, (see Table 4.5). Overall, these analyses suggest that the factor structures that emerged in Chapter 3 were not a good fit for the data when tested on a new lay population sample.

Sampling differences could potentially provide an explanation for this discrepancy. Consequently, demographic variables (e.g., age, gender, ethnicity, educational attainment) and LOC scores were compared between the lay population sample (see Table 4.9 for LOC scores) and the Chapter 3 sample. For gender, the proportion of males (32.3% versus 37.7%) and females (67.5% versus 60.8%) were not dissimilar across the previous and the current lay population samples respectively. This was also the case for age which ranged between 18 -74 years (*M*= 32.36, *SD*= 10.78) previously, and between 18-76 years (*M*= 34.43, *SD*= 12.87) in the current study. Similarly, levels of proximity to brain injury were also similar in the current versus previous sample: Low - 59% versus 51.8%; Medium - 13.3% versus 26.6%, and High - 27.8% versus 21.6%. Therefore, no notable demographic differences were observed between the two studies (and samples). Thus, sampling differences across the EFA and CFA was not considered an adequate explanation of the poor model fit of the hypothesised underlying factor structure of both the PBIM and BIAS.

Table 4.5

Goodness of Fit Indices for PBIM and BIAS

Goodness of fit measure	**PBIM**	**BIAS**	**Goodness of fit indices**
Chi- Square (X^2) goodness of fit	X^2 (614) = 1036.83, *p* <.001)	X^2 (164) = 416.63, *p* <.001)	*ns*
RMSEA (90% CI)	.06 (.05 - .07)	.09 (.08 -.10)	< .08
SRMR	.08	.11	<.05
CFI	.75	.78	> .9
TLI	.73	.75	> .9

4.4.3 Internal Consistency of the PBIM and BIAS

Following CFA, the internal consistency of both the PBIM and BIAS measures was also re-examined. Overall, the PBIM showed 'excellent' internal consistency, α=.83. Five of the subscale scores also fell within 'acceptable' (.7 > α ≥ .6) or 'good' (.8> α ≥

.7) parameters (See Table 4.6). However, the subscale ‘Permanence of brain injury’ subscale, which comprised four items, showed ‘unacceptable’ levels of internal consistency (α < .5). One item, ‘*Returning to work after brain injury is commonplace,’* was identified as contributing to its poor reliability, with its removal slightly improving the reliability of the subscale (α= .45 to α= .53), but with no change to the overall alpha for PBIM total score. Thus, the decision was reached to remove ‘*Returning to work after brain injury is commonplace,’* leading to a finalised 36-item PBIM measure (PBIM36).

Table 4.6

Cronbach's Alpha Values for the Six PBIM Subscales

PBIM scale number	PBIM subscale name	No. of items	Cronbach's alpha
1	Symptoms of brain injury	12	.76
2	Social determinants and consequences of brain injury	4	.75
3	Severity and impact of brain injury	6	.66
4	Insight	6	.77
5	Permanence of brain injury	4	.45[a]
6	Physical and medical expectations	5	.64

[a]Item ‘Returning to work after brain injury is commonplace’ was subsequently removed, increasing the alpha value to .53.

Internal consistency, using Cronbach's α, was ‘excellent’ for the overall 20-item BIAS (α= .80). Of the four BIAS subscales, three were shown to have ‘good’ (.8> α ≥ .7) levels of internal reliability (see Table 4.7), but the alpha value for ‘Empathy’ (.56) fell below the adequate range (.6> α ≥ .5). Whilst the ‘Empathy’ subscale had the lowest alpha value in Chapter 3, the value was above the ‘adequate’ range (.7> α ≥ .6). However, examination of individual items within the ‘Empathy’ subscale revealed that omitting items at this stage would not improve the alpha value. Therefore, whilst it is acknowledged that the internal consistency for the ‘Empathy’ subscale was shown to be inadequate in this study, all 20 items that formed the BIAS (now BIAS20) were retained. In addition, the overall BIAS total (α> .8) and remaining three subscale scores (.8> α ≥ .7), were broadly similar to those reported in Chapter 3 (BIAS total α= .84; BIAS subscales α = .65 - .77)

Table 4.7

Cronbach's Alpha Values for the Four BIAS Subscales

BIAS subscale number	BIAS subscale name	No. of items	Cronbach’s alpha
1	Social inclusion	6	.77
2	Empathy	5	.56
3	Genuineness	4	.77
4	Risk and dangerousness	5	.78

4.4.4 Test-Retest Reliability of the PBIM36 and BIAS20

To examine test-retest reliability for the PBIM36 and BIAS20, Intraclass Correlations (ICC) were calculated with 95% confidence intervals using a 2-way mixed effects model with absolute agreement for single measures (see Koo & Li., 2016; Qin et al., 2019). Using the accepted parameters where an ICC correlation between .75 and .90 indicates ‘good’ reliability, and between .5 and .75 indicates ‘moderate’ reliability (see Koo & Li., 2016), both the PBIM36 and BIAS20 showed ‘moderate’ test-retest reliability (see Table 4.8).

Table 4.8

ICC Calculations for the PBIM36 and BIAS20 Using Single Measures, Absolute - Agreement 2-way Mixed Effects Model

		95% confidence interval		**F test with true value 0**			
	Intraclass correlation	Lower bound	Upper bound	Value	df1	df2	*p*-value
PBIM36	.74	.56	.85	7.16	46	46	*p<.001*
BIAS20	.74	.58	.85	6.66	46	46	*p<.001*

4.4.5 Comparisons between Professional and Lay Population Sample for LOC

As in Chapter 3, the adapted version of the Level of Contact (LOC) form was used to measure participants' proximity to people with brain injury (see Holmes et al., 1999 for the original version), which was scored across 12 ranks. For the lay population sample, the modal rank was rank 4 ('*I have watched a documentary on the television and internet about brain injury'*), which was selected by 48 (24.1%) participants. For the professional sample, the modal rank was 8 (*'My job involves providing services/treatment for persons with a brain injury')* which was selected by 43 (56.6%) participants.

Following this, participants were grouped into one of three categories (Low = ranks 1-4, Medium = ranks 5-8, and High = ranks 9-12). For the lay population sample, most participants fell into the 'Low' levels of proximity category, with the remainder distributed relatively evenly between the 'Medium; and 'High' categories (see Table 4.9). In contrast, no professionals reported 'Low' levels of proximity, with most (57.9%) falling in the 'Medium' proximity category (see Table 4.9).

Table 4.9

LOC Categories for the Professional and Lay Population Samples

	Low LOC	Medium LOC	High LOC
Lay population	51.8 % (n = 103)	26.6% (n = 52)	21.6% (n = 43)
Professional	0% (n= 0)	57.9% (n = 44)	42.1 % (n = 32)

Note: Low = ranks 1-4, Medium = LOC ranks 5-8, High = LOC ranks 9-12

For the purposes of performing a chi-square analysis and to aid subsequent interpretation (see Sharpe, 2015), the Medium and High categories were combined. Thus, a new LOC variable with two categories - Low and Medium-High – was created. Subsequently, a 2x2 chi- square test of independence showed that there was a significant association between sample type (professional and lay population) and the LOC categories (Low and Medium – High), $X^2(1) = 63.05$, $p < .001$. As anticipated and compared to expected values, counts were higher in the 'low' category for the lay population sample, and higher in the 'Medium - High' category for the professional sample. Thus, the professional group reported significantly greater levels of proximity to brain injury compared to the lay population.

4.4.6 Comparisons between the Professional and Lay Population Sample for the PBIM

The purpose of the next set of data analysis was to evaluate the discriminant validity of the PBIM36. First, descriptive statistics (see Table 4.10) were calculated for the predictor variables: (1) Age; (2) Years of Education; and (3) the PBIM total and subscale scores for each sample type (lay population and professional). In terms of gender, 60.8% (n = 121) of the lay population sample were female compared to 79.7%

(n = 59) in the professional sample.

Table 4.10

Descriptive Statistics of the Predictor Variables Including PBIM Scores for the Lay Population and Professional Sample

	Sample type	
Predictor variables for ANCOVA and binary logistic regression	**Lay population mean (SD)**	**Professional mean (SD)**
Age in Years	34.43 (12.87)	42.36 (11.58)
Mean Years of Education	16.09 (2.15)	17.74 (2.34)
PBIM Subscale Scores		
Signs and symptoms of brain injury	62.25 (8.30)	73.91 (6.79)
Social determinants and consequences of brain injury	16.31 (4.30)	20.88 (4.47)
Severity and impact of brain injury	29.57 (4.51)	32.85 (5.36)
Insight	26.89 (5.59)	33.01 (5.03)
Permanence of brain injury	12.17 (2.76)	14.86 (3.40)
Physical and medical expectations	20.83 (4.70)	28.23 (5.68)

In the first step of analysis, a series of one-way between subjects ANCOVAs were conducted to assess if there were any significant differences between the professional and lay population sample for the total and subscale PBIM scores, after controlling for Age, Gender (dummy coded 0 = Male, 1 = Female, 2 = Other Gender Identity, 3 = Not specified), and Years of Education. Sample type was the independent variable which had two conditions (lay population sample and professional sample), and the dependent variable was either the total PBIM36 score or one of its six subscale scores. It was anticipated that PBIM36 scores would be higher in the professional sample, indicating higher levels of knowledge. Consistent with this, the professional sample (M= 203.74, SD= 20.32) scored significantly higher on the PBIM36 than the lay population sample (*M*= 168.02, *SD*= 18.26), $F(1,268) = 139.44$, $p<.001$, $\eta_p^2=.342$. Similarly, professionals also scored significantly higher on each of the PBIM36 six subscales than the lay population (see Table 4.11). The covariate 'Years of Education' was significantly and positively related to PBIM36 total scores, $F(1, 268) =11.36$, $p=.001$, $\eta_p^2=.041$.

Table 4.11

Comparisons between Professionals and Lay Population for PBIM Total and Subscale Scores

PBIM subscale	F (1, 268)	*p*-value	η_p^2
Signs and symptoms of brain injury	77.20	<.001	.22
Social determinants and consequences of brain injury	41.79	<.001	.14
Severity and impact of brain injury	21.19	<.001	.07
Insight	54.12	<.001	.17
Permanence of brain injury	29.56	<.001	.10
Physical and medical expectations	77.13	<.001	.22

Note: Age, Gender and Years of Education were included as covariates.

As these ANOCVAs were significant, the next stage was to test the sensitivity of the PBIM36 in predicting the respondent's group (professional or lay) from PBIM36 total and subscale scores. Binary logistic regression was used because the outcome variable was binary (professional or lay sample), and the predictors included both continuous and categorical variables.

The outcome variable was dummy coded with two categories: Lay sample (dummy code = 0) and Professional sample (dummy code = 1). The enter method was used to evaluate two models: Model 1: Age, Gender, and Years of Education; Model 2: covariates plus PBIM36 total/subscale scores (see Table 4.12).

Overall, these analyses showed that the total PBIM36 and subscale scores significantly predicted whether respondents were from the Lay or Professional samples. As a measure of effect size, Nagelkerke R^2 change was calculated (Model 2 Nagelkerke R^2 −Model 1 Nagelkerke R^2), which quantified the additional predictive power of the PBIM over the Model 1 covariates. The largest effect was for the PBIM total score (Nagelkerke R^2 change = .36), and the smallest effect was for the 'Severity and Impact of Brain Injury subscale (Nagelkerke R^2 change =.08). To evaluate the accuracy of the models, the percentage of correct predictions was reviewed, where classification tables provide information on the predictive accuracy of the binary logistic regression model. When the PBIM36 total and subscale scores were included in the logistic regression model, the model correctly classified between 77.7% (Severity and Impact of Brain Injury) and 87.2% (PBIM36 Total) of cases. Furthermore, focusing on how accurately the model predicted the professional sample, percentages ranged between 41.9% (Severity and Impact of Brain Injury) and 71.6% (PBIM36 Total) for correct classifications (see Table 4.12). Odds ratios (OR) also demonstrated that a one-unit increase in the predictor variable (PBIM36 total or subscale scores) resulted in an increased likelihood that participants were in the professional sample. The OR for the PBIM36 total score was OR = 1.09 and ranged from OR = 1.16 to 1.27 (see Appendix N) for the six subscales. These results suggest that the PBIM is sensitive to detecting differences in knowledge levels between professionals working in the field of brain injury and members of the general population, with the PBIM total and subscale scores consistently predicting professional group membership.

Table 4.12

Model and Predictors for the PBIM Total and Subscale Scores

Regression model	PBIM score/subscale	Model x^2	*df*	*P*-value	Nagelkerke R^2	Nagelkerke R^2 change (Model 1 to Model 2)	Classification % correct (% correct professional)
Model 1: Age, Years of Education, Gender		51.13	3	<.001	.25	-	76.6 % (35.1%)
Model 2: Model 1 and PBIM total/subscale scores	PBIM Total scores	146.70	4	<.001	.60	.36	87.2% (71.6%)
	Signs and symptoms of brain injury	119.093	4	<.001	.52	.27	85.3% (64.9%)
	Social determinants and consequences of brain injury	89.33	4	<.001	.41	.16	81.3% (52.7%)
	Severity and impact of brain injury	70.84	4	<.001	.33	.08	77.7% (41.9%)
	Insight	103.84	4	<.001	.46	.21	83.5% (62.2%)
	Permanence of brain injury	76.78	4	<.001	.36	.11	82.4% (52.7%)
	Physical and medical expectations	108.74	4	<.001	.48	.23	85.0% (60.8%)

4.5 Discussion

The overarching aim of this Chapter was to further evaluate the 'Perception of Brain Injury Scale (PBIM36)' and 'Brain Injury Awareness Scale (BIAS20).' First, confirmatory factor analysis (CFA) was used to establish if the proposed factor structures, identified through exploratory factor analysis (EFA) in Chapter 4, could be replicated in an independent sample. Second, test-retest reliability analysis was conducted to examine the stability of both the BIAS and PBIM measures over time. Finally, the sensitivity of the PBIM measure to detect differences in knowledge levels between a lay population and professional sample was examined.

In relation to the first component, confirming scale dimensionality is often overlooked in psychometric analysis, and commonly ends after EFA (Boateng et al., 2018). However, a combined approach using both EFA and CFA is preferrable to ensure that construct validity is fully explored (DeVellis, 2003). Therefore, CFA was conducted for the PBIM and BIAS. For the PBIM, the hypothesised six-factor structure was found to be an inadequate fit. Similarly, CFA showed that the four- factor model proposed for the BIAS was a poor model fit, and thus the hypothesised structure determined by EFA was similarly not confirmed. Modification indices can be used to improve and modify the structure in CFA (Morgado et al., 2018; Reise et al. 2000); however, this would be preferable in a larger sample than the one in this study (Li, 2016). Thus, at this stage and given the differences in findings across the two studies (Chapters 3 and 4), the scale dimensionality proposed by EFA for both the PBIM, and BIAS is unconfirmed.

Within the PBIM, internal consistency was lowest for the 'Permanence of brain injury' subscale, although the removal of one item partially addressed this problem. Within the BIAS, the ‘Empathy’ subscale had the lowest internal consistency, but no items would have improved the overall alpha value if removed. In psychometric testing, internal consistency is the most commonly adopted metric to examine reliability (Morgardo et al., 2017), which is also evidenced across existing brain injury perception measures (e.g., the CM-TBI; Linden et al., 2013; Pappadis et al., 2011). Here, the overall PBIM and BIAS scales demonstrated 'excellent’ internal consistency (Cronbach, 1951). However, subscale consistency tended to be lower, with one subscale in each measure falling below adequate levels.

Therefore, whilst excellent levels of internal consistency for total PBIM and BIAS scores were found in both Chapters 3 and 4, some subscales fell below ‘adequate’ thresholds, and initial factor structures were also not replicated. Consequently, until further validity testing on the PBIM and BIAS is conducted to fully establish construct validity – ideally in larger samples (N > 500; Li, 2016) - interpretation of individual PBIM and BIAS subscales should be approached with some caution. Indeed, rather than representing confirmed underlying latent constructs, subscales should be viewed at this stage as useful descriptors for sub- themes of perceptions of brain injury constructs. In this way, subscales offer a fruitful way in which to further explore perceptions of brain injury. Indeed, given the robust approach to item development and psychometric testing so far for the PBIM and BIAS, using the subscales to describe data thematically for multiple items has clear benefits to researchers. It provides more detailed information about perceptions across multiple themes than the overall total scores provide, but equally avoids the likely idiosyncrasies of relying on data from individual items; thus, overcoming a common issue in prior perception of brain injury research (e.g., Hux et al., 2006)

In addition to internal reliability, test-retest reliability is an equally important consideration in psychometric testing (Multon, 2012). However, and with the exception of the RoCKAS-ST (Rosenbaum & Arnott, 2009), test-retest reliability has largely been ignored in the perceptions of brain injury literature. Consequently, the second focus of this study was to examine the test re-test reliability of the PBIM and BIAS. Unlike mood which fluctuates naturally over time, attitudes and knowledge tend to be relatively stable (Multon, 2012). Therefore, measures scored over different timepoints to assess test-retest reliability, was considered appropriate (see Salkind, 2012). Overall, the PBIM36 and BIAS20 had adequate levels of test- retest reliability, which were above the values reported for the knowledge-based perceptions measured in the RoCKAS-ST (Rosenbaum & Arnott, 2009).

The third aim of this study was to examine the sensitivity of the PBIM in detecting differences in expected knowledge levels of 'known' groups (i.e., professional versus lay population samples). Whilst professional samples have previously been used to examine sensitivity of misconception and perception-based measures of brain injury (McKendry et al., 2104), this is not a consistent approach within this area of research (e.g., Hux et al., 2006; Linden & Boylan, 2010). As predicted, professional participants had higher average total and subscale PBIM scores than the lay population. Furthermore, logistic regression analyses showed that PBIM total and subscale scores were able to discriminate between professional and lay participants. The two subscales which demonstrated the largest predictive capabilities for group assignment were 'Physical and medical expectations' and 'Sign and symptoms.' The consistency of these findings contrasts with previous measures which showed inconsistencies in knowledge differences across ‘known’ groups (see McKendry et al., 2014). In Summary, the PBIM36 has shown that it can consistently differentiate between ‘known’ groups, with professionals scoring higher on the PBIM total and subscales scores compared to members of the lay population.

4.5.1 Limitations and Future Directions

The principal limitation of this study was the lack of replication of the proposed factor structures for the PBIM and BIAS when CFA was performed. In the previous study, EFA was conducted to determine the hypothetical sub-structures of the PBIM and BIAS, and this was subjected to confirmatory analysis in an independent lay population sample in this study. However, Li (2016) demonstrated, through simulation, that chi-square test statistics are rejected more frequently with samples sizes of 200 compared to larger samples, leading to higher Type 2 error rates.

Indeed, the Type 2 error rate only reduced when sample sizes were above 500 (Li, 2016). Therefore, it is possible that the sample size used here (N = 199) was too small to confirm the factor structure replication. Thus, whilst CFA did not replicate the hypothesised six factor PBIM36 and four-factor BIAS20 models, performing CFA in a larger sample may yield more reliable findings on the underlying sub- structures of the PBIM36 and BIAS20. Therefore, the factor structure identified in Chapter 3 cannot be rejected or confirmed at this stage, with further research needed to evaluate the construct validity of these two measures. Additionally, the internal consistency of two subscales - one from the PBIM36, and one from the BIAS20 - fell below acceptable levels and led to the removal of one item from the PBIM36.

Consequently, at this stage, it is recommended that the subscales should be viewed with caution and used as descriptors for data analysis purposes. This caveat remains until further validity testing on the PBIM36 and BIAS20 has been undertaken to confirm scale dimensionality and sub-structure. Nevertheless, the subscales provide richer information about which aspects of brain injury perceptions have lower levels of knowledge amongst laypersons, giving a more comprehensive overview than simply focusing on overall PBIM36 and BIAS20 scores and still represents an improvement on existing scales.

4.5.2 Conclusion

The aim of this Chapter was to conduct rigorous psychometric evaluation of the PBIM36 and BIAS20 as part of the third phase of scale construction. This involved conducting CFA and test-retest reliability on both the PBIM36 and BIAS20; as well as sensitivity testing on the PBIM36. Overall, the reliability of the total scores on the PBIM36 and BIAS was shown to be at least adequate for internal consistency and temporal stability. However, internal consistency of the subscales for both measures were not consistently within acceptable parameters. For the PBIM, this led to the removal of one item - leaving a finalised 36-item PBIM measure (PBIM36). In contrast, no items were removed on the 20-item BIAS (BIAS20). Furthermore, sensitivity analysis for the PBIM36 showed that this instrument discriminated well between ‘known’ groups with professionals scoring higher on the total PBIM36 scale and all subscales.

4.5.3 Overall Summary for PBIM and BIAS Development and Psychometric Analysis

A systematic and rigorous approach to psychometric evaluation has been adopted across the three phases of scale construction; (1) Item Development (Chapter 3); (2) Scale Development (Chapter 3) and (3) Scale Evaluation (Chapter 4). This process commenced with the development of two large item sets, conforming to DeVellis's (2013) recommendation that the initial item pool should be approximately three to four times as large as the final scale set. This allows for an expected significant loss of items once item-based reduction methods (e.g., EFA) are implemented. Finally, a process of scale evaluation was followed, resulting in the finalised versions of the 36-item PBIM (PBIM36; See Appendix O and the 20-item BIAS (BIAS20; see

Appendix P). Though further research is needed to explore their construct validity, the PBIM36 and BIAS20 provide a solid foundation for the measurement of both attitudes-based and knowledge-based perceptions of brain injury.

Chapter 4: Key Messages

- Whilst the hypothesised factor structure was not replicated here for the PBIM36 and BIAS20, test-retest reliability was adequate.
- Importantly, the PBIM consistently discriminated between layperson and professional knowledge of brain injury, indicating that the PBIM is sensitive to expected knowledge differences.
- Two final measures were devised - the 36-item PBIM (PBIM36) and 20-item BIAS (BIAS20). However, given the lack of factor structure replication, further psychometric testing is required in a new sample.

Chapter 5 Knowledge and Attitude-Based Perceptions of Brain Injury Using the PBIM36 and BIAS20: Similarities and Differences in Professional and Lay Populations

5.1 Chapter Overview

In Chapter 4, phase three of scale evaluation was conducted. Whilst CFA did not replicate the same factor structure found with EFA for both the PBIM36 and BIAS20, 'moderate' test-retest reliability was found for both measures; indicating sufficient temporal stability. Lack of factor structure replication is a commonly encountered difficulty when confirmatory analysis is undertaken in a new sample (Boateng et al., 2018) and therefore, and as previously noted in Chapter 4, the underlying factor structure of the two scales remains unconfirmed at present. Future research, albeit outside of this thesis body and what is reported here, will examine the dimensionality of the PBIM36 and BIAS20 in a larger sample (i.e., whether a better model fit is provided as a unidimensional or multi-dimensional scale) and fit of remaining items (see Boateng et al., 2018).

Crucially, however, the PBIM36 was found to be sensitive to knowledge differences between a professional and lay population sample, with professionals consistently scoring higher on the PBIM36. This finding provides good evidence that the PBIM36 is a useful tool for exploring knowledge-based perceptions of brain injury in a general population. Consequently, the PBIM36 in its current form may offer crucial insights to identify specific misperceptions amongst laypersons to target as research questions for subsequent perception based experimental research. Therefore, the primary aim of this Chapter is to present further in-depth exploratory analysis on the individual items of the PBIM36 to identify key areas of misperceptions amongst laypersons which may impact on how information about TBI is evaluated. These findings will then inform future experimental manipulations and associated materials for this thesis which aims to explore how perceptions of TBI may impact on important decisions around sentencing in criminal trials (see Chapter 6-8). A second further key aim of this Chapter is to explore whether and how attitudes towards people with brain injury differ between laypersons and professionals.

With the latter aim, the majority of perception-based research has so far focused on exploring knowledge-based perceptions of brain injury. However, given the potential for attitudes to influence behaviour (see Ajzen et al., 2018), further understanding the attitudes that exist about those with brain injury is also important. So far, attitude-based research has focussed on evaluating perceptions towards brain injury in non-expert health professionals (e.g., Linden & Redpath, 2011; Redpath et al, 2010) and general population samples (e.g., Irwin & Fortune, 2014; Linden & Crothers, 2006). Thus, insufficient attention has generally been paid to the attitudes that professional experts in the field of brain injury hold towards individuals with brain injury.

A lack of focus on attitudes in brain injury research does not appear to be unique to the context of brain injury though, as research exploring attitudes of professionals working in mental health settings has often been similarly overlooked (Wahl & Areosty-Cohen, 2010). That is, research has tended to favour investigating public attitudes towards mental illness at the expense of professionals' attitudes, potentially because of an assumption that professionals will typically hold more positive attitudes than lay populations (Wahl & Areosty-Cohen, 2010). However, this may not always be the case (Schulz, 2007). For example, whilst Kingdon et al. (2004) found that psychiatrists were less likely to view individuals with schizophrenia as dangerous or unpredictable than the public, Lauber et al. (2006) observed little difference between psychiatrists and laypersons when they rated their willingness to socially interact with individuals with mental illness in difference social settings. Thus, more accurate knowledge may not always equate to more positive attitudes.

Consequently, the aim of this Chapter was two-fold: (1) to comprehensively explore knowledge and attitudes-based perceptions of brain injury in a lay and professional population using the newly developed PBIM36 and BIAS20 measures, and (2) to identify key differences in knowledge-based perceptions between laypersons and professionals to inform future experimental manipulations and associated materials (see Chapter 6).

5.2 Methods

5.2.1 Participants

This Chapter is focused on further analysing data collected for Chapter 4, with two sub-sets of participants data being analysed, namely a lay population sample and a professional sample. The participants recruited for this study have been previously outlined (see Chapter 4, section 4.3.1). For the professional sample, two-subsets of data were analysed. For the PBIM36, the same subset described in Chapter 4 is analysed here. A second subset of the data was analysed for the BIAS20 (n=75). Therefore, whilst sample size differed, the demographic and professional profile of both subsets was very similar. Demographic details for the subset of participants for the BIAS20 is presented in Appendix Q.

5.2.2 Design, Materials and Procedure

This information was outlined previously in Chapter 4 (Section 4.3 Methods).

5.2.3 Statistical Analysis

For the PBIM36 and BIAS20, mean, standard deviation, along with minimum and maximum scores were calculated for each item. For the PBIM36, individual items are scaled from 1 – 7 (where 1 = Definitely False and 7 = Definitely True) with a mid-point (4 = uncertain) denoting uncertainty. Mean scores falling below the midpoint of the scale (i.e., below 4) indicate inaccurate knowledge and can be considered a misconception. For the BIAS, individual items are scaled from 1 – 7 (where 1 = Strongly Disagree and 7 = Strongly Agree) with a neutral midpoint (4 = neither agree nor disagree), and with higher mean scores indicating more favourable attitudes. For some data analysis, responses have also been collapsed into three categories to aid interpretation. For the PBIM36 these categories are: (1) False = scale points 1, 2 and 3; (2) Uncertain = scale point 4, and (3) True = scale point 5,6, and 7. For the BIAS20, these categories are: (1) Negative = scale points 1, 2 and 3; (2) Neutral = scale point 4, and (3) Positive = scale points 5, 6 and 7. Furthermore, differences in knowledge-based perceptions were explored in Chapter 4 for the PBIM36 (Chapter 4, section 4.4.5), but has yet to be explored for the BIAS20. Thus, the same statistical analytic approach adopted for the PBIM36 was replicated here for the BIAS20.

5.3 Results

5.3.1 Evaluating Knowledge-Based Perceptions: PBIM36

5.3.1.1 Lay Population Sample

Descriptive statistics for individual items of the PBIM36 (see Appendix O) are presented for both professionals and laypersons in Table 5.1, along with the mean score difference for each item (Mean difference = professional scores-lay population scores). For the lay population sample, mean scores for individual PBIM36 items ranged between 3.84 and 5.58. Of these, five items (Items 14, 15, 30, 34 and 35) scored below the mid-point of the scale (M = 3.84- 3.98), with the majority of respondents considering these items ‘False’ (3 = ‘Possibly False’) and thereby indicating a misconception. Three of these items were from the subscale ‘Social determinants and consequences of brain injury’ (subscale 2), one item was from ‘Permanence of brain injury (subscale 5), and two from ‘Physical and Medical Expectations’ (subscale 6).

In contrast, eighteen items (Items 2, 7, 11, 13, 16, 20, 21, 23, 24, 25, 26, 27,28, 29, 31, 32, 33, and 36) had mean scores between scale points 4 and 5 (M = 4.03 – 4.82) - indicating uncertainty (e.g., ‘*Losing your sense of role and purpose in life is not normally a consequence of brain injury’*). All four items from the 'Insight' subscale were among these eighteen, with the remainder drawn from the remaining five subscales. The remaining 13 items (Items 1, 3, 4, 5, 6, 8, 9, 10, 12, 17, 18, 19, and 22) had mean scores above 5 (M= 5.07-5.58), indicating that most respondents considered these items to be true (5 = ‘Possibly True’). Nine of these items were drawn from the 12-item ‘Signs and symptoms of brain injury’ subscale, with the remaining four items belonging to the six-item ‘Severity and impact of brain injury’ subscale. Mean values for each item are presented in Table 5.1

5.3.1.2 Professional Population Sample

For the professional sample, mean PBIM36 scores were higher, ranging between 4.87 and 6.64. (See Table 5.1). In contrast to lay population responses, no items for the professional population were scored as misconceptions (mean scores below 4). Only two items had mean values between 4 and 5, indicating uncertainty, and these were: (1) ‘A *complete recovery after brain injury is unlikely, even if the person tries hard to get better’* from the ‘Permanence of Brain Injury’ subscale (*M*=4.87), and (2) ‘*A person with brain injury can easily exaggerate their symptoms’* from the ‘Signs and symptoms of brain injury’ subscale (*M*= 4.92). Of the remaining items, 25 items had mean scores between 5 and 6 (*M*=5.01- 5.95) and were drawn from across all subscales. The final nine items had mean values above 6 (*M*= 6.31-6.64) and were all from the 'Signs and symptoms of brain injury’ subscale. These findings are consistent with the logistic regression findings presented in Chapter 4, and apart from the two items where mean scores indicated a degree of uncertainty, all means for the professional sample indicated accurate knowledge perceptions of brain injury.

Table 5.1

Mean Scores for Professional and Lay Population Sample for Individual Items of the PBIM36, including Mean Difference between the Samples

PBIM	Item	Professional population (n = 74)				Lay population (n = 199)				
		Min	**Max**	***M***	***SD***	**Min**	**Max**	***M***	***SD***	***M-diff***
Signs and symptoms of brain injury (12-items)										
	1. Anyone can easily mimic the effects of brain injury[a]	2	7	5.64	1.48	1	7	5.28	1.37	0.37[b]
	2. Losing your sense of role and purpose in life is not normally a consequence of brain injury[a]	1	7	6.31	1.38	1	7	4.73	1.51	1.59[b]
	3. Sleeping difficulties are uncommon after brain injury[a]	1	7	6.32	1.17	1	7	5.11	1.37	1.21[b]
	4. Compared to the general population, rates of depression are no different in people with brain injury	2	7	6.38	0.98	1	7	5.09	1.41	1.28[b]
	5. The likelihood of depression does not increase after brain injury[a]	1	7	6.45	1.03	1	7	5.39	1.20	1.06[b]
	6. Decision making is not typically affected by brain injury[a]	2	7	6.56	0.84	2	7	5.58	1.09	0.98[b]
	7. Getting angry easily and quickly is not normally associated with brain injury[a]	2	7	6.44	1.08	1	7	4.82	1.52	1.62[b]
	8. A person with brain injury is fully in control of their actions[a]	1	7	5.63	1.31	2	7	5.11	1.10	0.52[b]
	9. Changes in a person's personality are uncommon after brain injury[a]	1	7	6.31	1.29	1	7	5.55	1.23	0.76[b]
	10. Physical, memory and social recovery occur at the same rate following brain injury[a]	1	7	6.64	0.86	1	7	5.53	1.29	1.11[b]
	11. A person with brain injury can easily exaggerate their symptoms[a]	1	7	4.92	1.58	1	7	4.63	1.38	0.29[b]
	12. The effects of brain injury are often insignificant and unremarkable[a]	1	7	6.32	1.09	2	7	5.42	1.31	0.90[b]
Social determinants and consequences of brain injury (4-items)										
	13. Many people with brain injury are at an increased risk of homelessness	1	7	5.45	1.39	1	7	4.56	1.30	0.89[b]
	14. Brain injury increases the risk of using illegal substances (e.g., drugs)	1	7	5.11	1.36	1	7	3.88	1.44	1.23[b]
	15. Having a brain injury increases the likelihood of getting into trouble with the law	1	7	5.16	1.76	1	7	3.84	1.46	1.32[b]

	1	7	5.13	1.61	1	7	4.03	1.48	1.10[b]
16. A person who is homeless is at a greater risk of experiencing brain injury	2	7	5.95	1.18	1	7	5.12	1.17	0.83[b]
Severity and impact of brain injury (5-items)									
17. The impact of concussion is cumulative (the impact becomes greater with each individual concussion)	1	7	5.31	1.52	2	7	5.35	1.06	-0.04[c]
18. The severity of brain injury increases with each additional concussion	1	7	5.89	1.27	2	7	5.35	1.10	0.54[b]
19. The more concussions you experience, the more damaging they become	1	7	5.09	1.71	2	7	4.50	1.58	0.59[b]
20. A concussion is normally harmless[a]	1	7	5.04	1.83	1	7	4.19	1.33	0.85[b]
21. Having one brain injury increases the chances of having another	1	7	5.61	1.57	2	7	5.07	1.07	0.54[b]
Insight (6-items)									
22. The impact of childhood brain injury can take years to become apparent	2	7	5.60	1.28	1	7	4.46	1.40	1.14[b]
23. People with brain injury have a good understanding of the impact of their brain injury on themselves and others[a]	2	7	5.87	1.11	1	7	4.81	1.32	1.06[b]
24. Most people have a clear picture and understanding of how their brain injury may have affected them[a]	1	7	5.52	1.44	1	7	4.44	1.46	1.08[b]
25. A person with brain injury best understands the consequences of their injury on themselves and others[a]	2	7	5.01	1.41	1	7	4.15	1.30	0.86[b]
26. A person with brain injury lacks awareness and understanding of the consequences of their actions	1	7	5.13	1.62	1	7	4.23	1.35	0.90[b]
27. People with brain injury lack awareness of the impact of their behaviour on others	2	7	5.87	1.28	1	7	4.80	1.39	1.07[b]
28. The effects (if any) of brain injury are obvious to the person with brain injury[a]	1	7	4.87	1.88	1	7	4.10	1.33	0.77[b]
Permanence of brain injury (3-items)									
29. A complete recovery after brain injury is unlikely, even if the person tries hard to get better	1	7	5.01	1.81	1	7	3.98	1.34	1.03[b]
30. The effects of brain injury are permanent	1	7	5.03	1.62	1	7	4.09	1.18	0.94[b]
31. A person is unlikely to return to their normal self after a brain injury									
Physical and medical expectations (5-items)									

32. Physical recovery from brain injury is a good indicator of overall recovery[a]	1	7	5.88	1.41	1	7	4.27	1.46	1.61[b]
33. Evidence of brain injury is always detectable from a scan[a]	1	7	5.95	1.43	1	. 7	4.71	1.56	1.24[b]
34. Recovery after brain injury is focused on achieving good physical outcomes[a]	1	7	5.08	1.98	1	7	3.88	1.37	1.20[b]
35. The primary goal of rehabilitation is to improve physical functioning[a]	1	7	5.69	1.7	1	7	3.89	1.5	1.80[b]
36. Brain injury mostly affects memory, but in other ways a person can be completely normal[a]	1	7	5.55	1.73	1	7	4.08	1.48	1.47[b]

[a]items have been reverse scored for data analysis [b]denotes items where professionals had higher mean scores than laypersons [c] denotes items where professionals had higher mean scores than laypersons

5.3.2 Comparisons between Lay Population and Professional Samples on the PBIM36

Overall, professionals scored higher than laypeople on 35 items of the PBIM36 (see Table 5.2). Of these, the largest mean difference (*M*= 1.80) was for item '*The primary goal of rehabilitation is to improve physical functioning*' from the 'Physical and medical expectations' subscale, whereas the smallest mean difference (*M*=0.29) was for item '*A person with brain injury can easily exaggerate their symptoms'* from the 'Signs and symptoms of brain injury' subscale. Overall, 19 items had mean differences above one, including all five items from the 'Physical and medical expectations' subscale. Furthermore, two of the 'Physical and medical expectations' items (Items 34 and 35) were misconceptions in the lay population. One item '*The severity of brain injury increases with each additional concussion'* from the 'Severity and impact of brain injury' subscale rated lower (Mean difference = -0.04) in professionals compared to laypersons, although the difference was negligible.

Further differences were revealed between lay population and professionals when the percentage of responses that fell into 'false' (scale points 1-3), 'uncertain' (scale point 4), and 'true' (scale points 5-7) categories were examined (see Table 5.2). The professional sample had a higher proportion of accurate responses (i.e., scoring items as true) compared to the lay population across all items. Overall, professionals had an accuracy score of over 90% for 10 items, 80%-90% for 11 items, 70% -80% for 11 items, and 60%-70% for four items. In stark contrast, no items had accuracy scores over 90% in the lay population. Accuracy was 80% -90% for three items, 70% -80% for nine items, 60% - 70% accuracy for six items, 50% - 60% for six items, 40%- 50% for six items, 30% - 40% for five items and 20% -30% for one item. Across all items, the lay population also had a higher proportion of participants who were uncertain about the items. Professionals also responded with a higher proportion of false answers than the lay population on four of the 36 PBIM items. However, this difference is likely attributable to laypersons responding with higher levels of uncertainty for these items.

In line with logistic regression analysis conducted in Chapter 4, the subscale where observed differences were greater between lay and professional samples was 'Physical and medical expectations.' This subscale also contained the '*Recovery after brain injury is focused on achieving good physical outcomes,*' which was the least accurately scored item overall for the lay population.

Table 5.2

Percentage of False, Uncertain and True Responses on the PBIM36 for Professional and Lay Population Samples, Including Percentage Differences between the Samples

		Percentage (%) responses by scoring category								
		False[b]			Neutral[c]			True[d]		
PBIM items		Prof.[e]	Lay[f]	% Diff[g]	Prof.[e]	Lay[f]	% Diff[g]	Prof.[e]	Lay[f]	% Diff[g]
1	Anyone can easily mimic the effects of brain injury[a]	14.9%	13.1%	1.8%	8.1%	14.6%	-6.5%	77.0%	72.4%	4.6%
2	Losing your sense of role and purpose in life is not normally a consequence of brain injury[a]	6.8%	23.1%	-16.3%	2.7%	15.6%	-12.9%	90.5%	61.3%	29.2%
3	Sleeping difficulties are uncommon after brain injury[a]	4.1%	11.6%	-7.5%	1.4%	17.6%	-16.2%	94.6%	70.9%	23.7%
4	Compared to the general population, rates of depression are no different in people with brain injury	2.7%	13.1%	-10.4%	2.7%	21.1%	-18.4%	94.6%	65.8%	28.8%
5	The likelihood of depression does not increase after brain injury[a]	2.7%	5.5%	-2.8%	1.4%	18.1%	-16.7%	95.9%	76.4%	19.5%
6	Decision making is not typically affected by brain injury[a]	1.4%	5.0%	-3.6%	1.4%	7.5%	-6.1%	97.3%	87.4%	9.9%
7	Getting angry easily and quickly is not normally associated with brain injury[a]	4.1%	20.6%	-16.5%	1.4%	15.1%	-13.7%	94.6%	64.3%	30.3%
8	A person with brain injury is fully in control of their actions[a]	8.1%	8.5%	-0.4%	4.1%	16.6%	-12.5%	87.8%	74.9%	12.9%
9	Changes in a person's personality are uncommon after brain injury[a]	5.4%	6.5%	-1.1%	0.0%	7.0%	-7.0%	94.6%	86.4%	8.2%
10	Physical, memory and social recovery occur at the same rate following brain injury[a]	1.4%	6.5%	-5.1%	0.0%	18.1%	-18.1%	98.6%	75.4%	23.2%
11	A person with brain injury can easily exaggerate their symptoms[a]	24.3%	22.1%	2.2%	13.5%	26.1%	-12.6%	62.2%	51.8%	10.4%
12	The effects of brain injury are often insignificant and unremarkable[a]	4.1%	10.1%	-6.0%	0.0%	12.6%	-12.6%	95.9%	77.4%	18.5%

13	Many people with brain injury are at an increased risk of homelessness	9.5%	16.6%	-7.1%	6.8%	26.6%	-19.8%	83.8%	56.8%	27.0%
14	Brain injury increases the risk of using illegal substances (e.g., drugs)	10.8%	35.2%	-24.4%	12.2%	30.7%	-18.5%	77.0%	34.2%	42.8%
15	Having a brain injury increases the likelihood of getting into trouble with the law	17.6%	39.7%	-22.1%	6.8%	20.6%	-13.8%	75.7%	39.7%	36.0%
16	A person who is homeless is at a greater risk of experiencing brain injury	16.2%	31.2%	-15.0%	10.8%	26.1%	-15.3%	73.0%	42.7%	30.3%
17	The impact of concussion is cumulative (the impact becomes greater with each individual concussion)	5.4%	8.5%	-3.1%	5.4%	18.1%	-12.7%	89.2%	73.4%	15.8%
18	The severity of brain injury increases with each additional concussion	14.9%	3.0%	11.9%	4.1%	17.6%	-13.5%	81.1%	79.4%	1.7%
19	The more concussions you experience, the more damaging they become	4.1%	6.0%	-1.9%	8.1%	12.6%	-4.5%	87.8%	81.4%	6.4%
20	A concussion is normally harmless[a]	24.3%	33.7%	-9.4%	4.1%	16.1%	-12.0%	71.6%	50.3%	21.3%
21	Having one brain injury increases the chances of having another	17.6%	24.6%	-7.0%	10.8%	32.7%	-21.9%	71.6%	42.7%	28.9%
22	The impact of childhood brain injury can take years to become apparent	12.2%	6.0%	6.2%	6.8%	22.1%	-15.3%	81.1%	71.9%	9.2%
23	People with brain injury have a good understanding of the impact of their brain injury on themselves and others[a]	10.8%	27.1%	-16.3%	2.7%	22.1%	-19.4%	86.5%	50.8%	35.7%
24	Most people have a clear picture and understanding of how their brain injury may have affected them[a]	5.4%	17.6%	-12.2%	1.4%	16.6%	-15.2%	93.2%	65.8%	27.4%
25	A person with brain injury best understands the consequences of their injury on themselves and others[a]	12.2%	28.1%	-15.9%	5.4%	20.1%	-14.7%	82.4%	51.8%	30.6%
26	A person with brain injury lacks awareness and understanding of the consequences of their actions	18.9%	30.7%	-11.8%	4.1%	20.1%	-16.0%	77.0%	49.2%	27.8%
27	People with brain injury lack awareness of the impact of their behaviour on others	20.3%	31.7%	-11.4%	6.8%	15.1%	-8.3%	73.0%	53.3%	19.7%
28	The effects (if any) of brain injury are obvious to the person with brain injury[a]	8.1%	19.6%	-11.5%	2.7%	17.1%	-14.4%	89.2%	63.3%	25.9%
29	A complete recovery after brain injury is unlikely, even if the person tries hard to get better	27.0%	34.7%	-7.7%	6.8%	25.1%	-18.3%	66.2%	40.2%	26.0%

30	The effects of brain injury are permanent	24.3%	35.7%	-11.4%	6.8%	29.6%	-22.8%	68.9%	34.7%	34.2%
31	A person is unlikely to return to their normal self after a brain injury	18.9%	32.7%	-13.8%	10.8%	26.1%	-15.3%	70.3%	41.2%	29.1%
32	Physical recovery from brain injury is a good indicator of overall recovery[a]	10.8%	35.2%	-24.4%	6.8%	18.1%	-11.3%	82.4%	46.7%	35.7%
33	Evidence of brain injury is always detectable from a scan[a]	8.1%	24.6%	-16.5%	5.4%	13.6%	-8.2%	86.5%	61.8%	24.7%
34	Recovery after brain injury is focused on achieving good physical outcomes[a]	28.4%	45.7%	-17.3%	8.1%	24.6%	-16.5%	63.5%	29.6%	33.9%
35	The primary goal of rehabilitation is to improve physical functioning[a]	12.2%	46.2%	-34.0%	8.1%	20.6%	-12.5%	79.7%	33.2%	46.5%
36	Brain injury mostly affects memory, but in other ways a person can be completely normal[a]	20.3%	41.2%	-20.9%	1.4%	22.1%	-20.7%	78.4%	36.7%	41.7%

[a]These items are reverse scored for data analysis. [b]False Category = scale points 1, 2 and 3 [c]Uncertain Category = scale points 4, [d]True Category= scale point 5,6, and 7.

5.3.3 Evaluating Attitude-Based Perceptions: BIAS20

5.3.3.1 Lay Population Sample

Descriptive statistics for individual items of the BIAS20 (see

Appendix P) are presented for both professionals and laypersons in Table 5.3, along with mean difference scores (Mean difference = professional scores -lay population scores). For the lay population sample, mean BIAS20 scores ranged between 3.71 and 5.84 (see Table 5.3). Generally, laypersons held positive attitudes towards those with brain injury, with 15 items (Items 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 17, 20) scoring above 5 (*M* = 5.14-5.84). These included all items from the 'Social inclusion' subscale. Four items (Items 9, 12, 16, 18) had neutral responses with mean scores falling between scale points 4 and 5 (*M* = 4.45- 4.78). For these neutral responses, items were drawn across the remaining three subscales of the BIAS20; 'Empathy,' 'Genuineness' and 'Risk and dangerousness.' Only item 19 '*People with brain injury are unlikely to be a danger to themselves'* ('Risk and dangerousness' subscale) scored below the midpoint of the scale (*M*= 3.72), indicating a negative attitude.

5.3.3.2 Professional Population Sample

For the professional population sample, mean BIAS20 scores ranged between 2.74 –6.66. In line with the lay population, professionals largely held positive attitudes to those with brain injury, with the same 15 items scoring above 5 (see Table 5.3). Of these, eight (Items 3, 6, 10, 13, 14, 15, 17 and 20) had mean scores between 5 and 6(*M* = 5.12-5.92), and seven (Items 1, 2, 4, 5, 7, 8, and 11) had means between 6 and 7 (*M* = 6.00-6.67). Therefore, professionals tended to hold more positive attitudes towards brain injury than laypersons, even though there was a greater spread in mean responses for professionals. In contrast to laypersons however, only two items had mean values indicating a neutral response. These were: (1) Item 12 '*Symptom exaggeration after brain* *injury is uncommon'* from the 'Genuineness' subscale and(2) Item 18 '*People with brain injury are no more dangerous than anyone else*,' from the 'Risk and dangerousness' subscale. For the remaining three items (items 9, 16, 19), professionals scored below the midpoint of the scale. Two of these were from the 'Risk and dangerousness' subscale: (1) *'People with brain injury are unlikely to be a danger to themselves or others*'; (2) '*People with brain injury pose no risk to other people,*' and (3) one item '*I would find it upsetting to observe someone with a brain injury*, was drawn from the 'Empathy' subscale.

Table 5.3

Mean Scores for Professional and Lay Population Sample for Individual Items of the BIAS20, Including Mean Difference between the Samples

			Professional (n= 75)				Lay population (n= 199)				
BIAS subscale	**Item**		**Min**	**Max**	**M**	**SD**	**Min**	**Max**	**M**	**SD**	***M* diff**
Social inclusion	1	I would feel unsure about mixing and interacting with someone with a brain injury[a]	3	7	6.55	0.72	1	7	5.42	1.46	1.13[b]
	2	I would feel reluctant to strike up a conversation with someone with a brain injury[a]	4	7	6.67	0.62	2	7	5.51	1.34	1.16[b]
	3	If I were a landlord, I would be reluctant to rent my house to a person with brain injury[a]	2	7	5.71	1.35	1	7	5.56	1.26	0.15[b]
	4	Meeting someone with a brain injury wouldn't scare or frighten me	1	7	6.29	1.07	1	7	5.25	1.49	1.04[b]
	5	I would feel uncomfortable being friends with a person who has a brain injury[a]	1	7	6.45	1.05	1	7	5.59	1.52	0.86[b]
Empathy	6	There is no need to be frightened of people with brain injury	3	7	5.92	1.15	2	7	5.62	1.16	0.30[b]
	7	The misfortune of people with brain injury has no emotional effect on me[a]	2	7	6.43	0.84	1	7	5.6	1.32	0.83[b]
	8	The unhappiness or distress of a person with brain injury would not be especially moving for me[a]	1	7	6.36	1.13	2	7	5.84	1.29	0.52[b]
	9	I would find it upsetting to observe someone with a brain injury	1	7	2.74	1.78	1	7	4.55	1.55	1.81[c]

Genuineness	10	If I knew someone with a brain injury, I would not feel particularly worried or concerned for them[a]	1	7	5.37	1.36	1	7	5.24	1.33	0.13[b]
	11	I would have a strong urge to help someone with a brain injury	1	7	6.00	1.46	2	7	5.19	1.09	0.81[b]
	12	Symptom exaggeration after brain injury is uncommon	1	7	4.43	1.78	1	7	4.45	1.39	-0.02[c]
	13	Typically, people with brain injury do not use their symptoms for personal benefit	1	7	5.68	1.27	1	7	5.38	1.30	0.30[b]
	14	Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life'	1	7	5.88	1.27	1	7	5.52	1.29	0.36[b]
Risk and dangerousness	15	People commonly use their brain injury to excuse their general manner and behaviour[a]	2	7	5.62	1.38	2	7	5.36	1.24	0.26[b]
	16	People with brain injury pose no risk to other people	1	7	3.91	1.34	1	7	4.26	1.28	0.35[c]
	17	People with brain injury are dangerous and pose a risk to society[a]	3	7	5.72	1.31	1	7	5.44	1.25	0.28[b]
	18	People with brain injury are no more dangerous than anyone else	1	7	4.66	1.52	1	7	4.78	1.52	0.12[c]
	19	People with brain injury are unlikely to be a danger to themselves or others	1	6	3.18	1.35	1	7	3.72	1.36	0.54[c]
	20	People with brain injury pose a threat to others[a]	2	7	5.12	1.46	2	7	5.14	1.27	0.02[c]

[a]Items are reverse scored for data analysis, [b]denotes items where professionals had higher mean scores than laypersons, [c] denotes items where professionals had higher mean scores than laypersons

5.3.4 Comparison between Professional and Lay Population Using the BIAS20

Overall, professionals scored higher on 14 BIAS20 items than laypersons (see Table 5.3). Of these items, the largest mean difference (*M* = 1.26) was for item 1 from the 'Social inclusion' subscale ('*I would feel reluctant to strike up a conversation with someone with a brain injury'*), whereas the smallest mean difference (*M* =0.13) was for item 3, also from the 'Social inclusion' subscale (*'If I were a landlord, I would be reluctant to rent my house to a person with brain injury'*). Items 1, 2 and 4 from the 'Social inclusion' subscale had a mean difference above one (Mean difference = 1.04-1.16). Professionals held more negative attitudes than laypersons (mean difference = -0.02 – - 1.81) on six items (Items 9, 12, 16, 18, 19, and 20). Four of these items were drawn from the 'Risk and dangerousness' subscale, with the item '*People with brain injury are unlikely to be a danger to themselves or others'* having the highest mean difference (-0.54). The two remaining items, *'Symptom exaggeration after brain injury is uncommon'* and *'I would find it upsetting to observe someone with a brain injury'* were drawn from the 'Genuineness' and 'Empathy' subscales, respectively. Furthermore, the latter item had the overall highest mean difference score (mean difference = -1.81), indicating professionals were more likely to disagree with this item. This is perhaps unsurprising given that professionals have a greater exposure and familiarity to those with a brain injury, and thus may be less likely to be upset by observing someone with a brain injury than laypersons.

Further similarities and differences between lay people and professionals were revealed when the percentage of responses that fell into 'negative' (scale points 1-3), 'neutral' (scale point 4) and 'positive' (scale points 5-7) categories were examined (see Table 5.4). For responses that fell into 'negative' (scale points 1-3), there were 10 items where the laypersons scored higher than the professionals, and 10 items where professionals scored higher than laypersons. However, professionals had the highest proportion (65.3%) of negative responses overall for item 9 from the Empathy subscale - *'I would find it upsetting to observe someone with a brain injury',* reflecting the pattern previously observed. Item 16, *'People with brain injury pose no risk to other people'*, had a higher proportion of neutral responses for professionals compared to laypersons (33% vs 28.6%). For this item, professionals are likely to be drawing on professional experience in their answers, and thus risk will vary by individual and reflected by higher proportion of neutral responses by professionals. In contrast, laypersons viewed risk differently and tended to be more favourable in their attitudes regarding risk. For the positive items, professionals had a higher proportion of positive responses for most items (17/20), compared to laypersons.

Table 5.4

Percentage of Negative, Neutral and Positive Responses for Professional and Lay Population Samples for the BIAS20, Including Percentage Differences between the Samples

		Percentage (%) responses by scoring category								
		Negative[b]			Neutral[c]			Positive[d]		
BIAS Item		Prof.[e]	Lay[f]	% Diff[g]	Prof.[e]	Lay[f]	% Diff[g]	Prof.[e]	Lay[f]	% Diff[g]
1	I would feel unsure about mixing and interacting with someone with a brain injury[a]	1.3	15.6	-14.3	1.3	9	-7.7	97.3	75.4	21.9
2	I would feel reluctant to strike up a conversation with someone with a brain injury[a]	0	12.1	-12.1	1.3	10.1	-8.8	98.7	77.9	20.8
3	If I were a landlord, I would be reluctant to rent my house to a person with brain injury[a]	12	7.5	4.5	8	14.1	-6.1	80	78.4	1.6
4	Meeting someone with a brain injury wouldn't scare or frighten me	2.7	15.6	-12.9	5.3	7.5	-2.2	92	76.9	15.1
5	I would feel uncomfortable being friends with a person who has a brain injury[a]	4	10.1	-6.1	0	10.6	-10.6	96	79.4	16.6
6	There is no need to be frightened of people with brain injury	6.7	6.5	0.2	6.7	8	-1.3	86.7	85.4	1.3
7	The misfortune of people with brain injury has no emotional effect on me[a]	0	8	-8	1.3	9.5	-8.2	98.7	82.4	16.3
8	The unhappiness or distress of a person with brain injury would not be especially moving for me[a]	2.7	8.5	-5.8	0	6	-6	97.3	85.4	11.9
9	I would find it upsetting to observe someone with a brain injury	65.3	24.6	40.7	13.3	15.1	-1.8	21.3	60.3	-39
10	If I knew someone with a brain injury, I would not feel particularly worried or concerned for them[a]	9.3	10.1	-0.8	9.3	13.1	-3.8	81.3	76.9	4.4
11	I would have a strong urge to help someone with a brain injury	6.7	6	0.7	0	17.1	-17.1	93.3	76.9	16.4
12	Symptom exaggeration after brain injury is uncommon	30.7	20.1	10.6	17.3	38.7	-21.4	52	41.2	10.8
13	Typically, people with brain injury do not use their symptoms for personal benefit	6.7	7.5	-0.8	8	18.1	-10.1	85.3	74.4	10.9
14	Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life'	5.3	8	-2.7	9.3	11.6	-2.3	85.3	80.4	4.9

15	People commonly use their brain injury to excuse their general manner and behaviour[a]	8	8.5	-0.5	14.7	17.6	-2.9	77.3	73.9	3.4
16	People with brain injury pose no risk to other people	37.3	30.7	6.6	33.3	28.6	4.7	29.3	40.7	-11.4
17	People with brain injury are dangerous and pose a risk to society[a]	8	5	3	14.7	21.1	-6.4	77.3	73.9	3.4
18	People with brain injury are no more dangerous than anyone else	25.3	22.6	2.7	16	20.1	-4.1	58.7	57.3	1.4
19	People with brain injury are unlikely to be a danger to themselves or others	64	45.7	18.3	14.7	29.1	-14.4	21.3	25.1	-3.8
20	People with brain injury pose a threat to others[a]	18.7	10.6	8.1	16	24.6	-8.6	65.3	64.8	0.5

[a]Items reverse scored for data analysis, [b]scores 1-3, [c]score 4, [d] scores 5-7, [e]professional sample, [f]lay population sample, [g]%difference

5.3.5 BIAS Logistic Regression Analysis: Lay Versus Professional Sample

In Chapter 4, a series of statistical analyses was conducted to evaluate the sensitivity of the PBIM36 to predict known groups (i.e., professional versus lay population), but the BIAS20 was not included in this analysis as it was not anticipated that scores on the BIAS20 would be discriminated based on professional expertise in the field of brain injury. Thus, the same analytic strategy adopted in Chapter 4 for the PBIM36 was replicated here for the BIAS20 so that attitude-based perceptions in both a lay and professional sample could be evaluated.

First, descriptive statistics for the BIAS20 (total and subscale) and SDS scores were calculated (see Table 5.5). Next, a series of ANCOVAs were conducted initially for the BIAS20 total and four subscale scores to establish if there were any differences between lay and professional samples. Similar to the ANCOVAs conducted on the PBIM36 (see Chapter 4), Age, Gender, and Years of Education were included as covariates. However, for the BIAS20 analyses, total SDS scores were also included as an additional covariate.

Table 5.5

Descriptive Statistics of the Predictor Variables Including BIAS20 Scores for the Lay Population and Professional Sample

Predictor variables for ANCOVA and binary logistic regression		Sample type	
		Lay population mean (*SD*)	**Professional mean (*SD*)**
SDS scores		17.28 (5.20)	16.01 (5.77)
BIAS20			
	BIAS20 total	103.42 (12.31)	108.91 (10.97)
	Social inclusion	32.94 (5.65)	37.59 (3.76)
	Empathy	26.42 (3.98)	27.01 (3.62)
	Genuineness	20.71 (4.03)	21.71 (4.49)
	Risk and dangerousness	23.35 (4.90)	22.60 (5.02)

Table 5.6 shows that the only significant differences between groups (sample type) were for the BIAS20 total sand Social inclusion subscale scores, with professionals having higher scores (i.e., more positive attitudes). SDS scores were also negatively associated with Social inclusion scores, $F(1, 268) = 6.63$, $\eta_p^2 = .02$. No other covariates were significant for the BIAS total and Social inclusion subscale scores (p>.05).

The remaining three subscales (Empathy, Genuineness and Risk and dangerousness) did not significantly differ between groups. However, for the Empathy subscale, gender was a significant covariate, $F(1, 268) = 17.85$, $p<.001$, $\eta_p^2 = .062$, such that lower scores were associated with being male. For the Genuineness scale, Years of Education was the only significant covariate, $F(1, 268) = 6.59$, $p<.011$, $\eta_p^2 =.024$, meaning that higher levels of education were associated with higher scores on this subscale. None of the covariates included in the ANCOVA were significant for the Risk and dangerousness subscale.

Table 5.6

Comparisons between Professionals and Lay Population for BIAS20 Total and Subscale Scores

BIAS20 score/subscale	***F* (1, 268)**	***p*-value**	η_p^2
BIAS20 Total	4.34	.038	.012
Social inclusion	31.07	<.001	.104
Empathy	0.51	.474	.002
Genuineness	0.40	.526	.002
Risk and dangerousness	3.69	.056	.014

Note: Age, Gender and Years of Education were included as covariates.

As the BIAS20 total and 'Social inclusion' subscale ANOCVAs were significant, the next stage in analyses was to test if these could predict sample types (professional or lay). Binary logistic regression was used because the outcome variable was binary (professional or lay sample), and the predictors included both continuous and categorical variables. The outcome variable was dummy coded with two categories: Lay sample (dummy code = 0) and Professional sample (dummy code = 1). Similar to the logistic regression analyses conducted on the PBIM36 (See Chapter 4), the enter method was used to evaluate three models: Model 1: Age, Gender, and Years of Education; Model 2: Age, Gender, Years of Education, and SDS; Model 3: Covariates plus BIAS20 total/Social inclusion subscale scores. As displayed in Table 5.7, Model 1 was significant, and little change was observed in the Nagelkerke R^2 value and percentage of overall classifications evidenced after SDS (Model 2) scores were added (see Table 5.7). Furthermore, the *b*-values for the SDS (*b*= -.037, *p*= .197) were not significant. In contrast, the *b*-values for the BIAS20 total scores (*b* = .028, *p*= .040) and Social inclusion subscale were significant, *b*= .214, *p*<.001. Odds ratios were OR= 1.03 and OR = 1.24 for BIAS20 total and Social inclusion scores, respectively. Therefore, for the BIAS20 analyses, the same pattern of findings was observed as the ANCOVA whereby both BIAS20 total and 'Social inclusion' scores significantly contributed to the model and were significant predictors of sample type.

Table 5.7

Model and Predictors for the BIAS20 Total and Subscale Scores

		BIAS20	**Model**	***df***	***p*-**	**Nagelkerke R^2**	**Change in Nagelkerke R^2 scores**	**Classification % correct (% correct professional)**	
1	Age, Years of education, gender		51.57	3	<.001		.248	_-	76.3% (34.7)
2	Model 1 and SDS		53.25	4	<.001		.256	.008	74.8% (36.0%)
3	Model 2 and BIAS20 total/ Social	BIAS20 Total	57.56	5	<.001		.274	.018	75.9% (36.0%)
		Social Inclusion	89.29	5	<.001		.403	.147	81.8% (58.7%)

5.4 Discussion

The aim of this Chapter was to explore knowledge- and attitude-based perceptions of brain injury in both professionals and laypersons, as they may offer (1) important insights into the misperceptions that laypersons hold which may impact on how information about TBI is evaluated, and (2) inform future experimental manipulations and associated materials for this thesis which aims to explore how perceptions of TBI may impact on important decisions around sentencing in criminal trials. In Chapter 4, the PBIM36 was shown to be sensitive to expected knowledge differences between a lay and professional sample. A more detailed examination of those differences showed that overall, professionals had higher accuracy ratings across every item on the PBIM36 compared to laypersons, indicating that professionals consistently hold more accurate knowledge-based perceptions of brain injury. A more detailed examination of the key differences between these two groups revealed that the subscale 'Physical and medical expectations' was an important area of difference. Specifically, laypersons were more likely to endorse views that physical recovery was a good indicator of overall recovery from brain injury, and that rehabilitation and recovery processes were focused on achieving good *physical* outcomes.

Further, laypersons also perceived that a brain injury could result in memory impairment without impacting the person in other ways. These findings indicate that laypersons may be unable to take account of the hidden cognitive, emotional, and social consequences of TBI. Instead, laypersons may focus on the *physical* aspects of injury and recovery, and then subsequently evaluate the person based on this. Consistent with this, previous research has found that a visible outward manifestation of injury - such as a physical injury marker - may draw an observer's attention to TBI-related disability (McClure, 2011; McClure et al., 2006). In McClure et al.'s (2006) study, participants read a vignette describing the circumstances of an adolescent who had sustained a head injury, along with a description of the parent's observations of a change in his recent behaviour. These behavioural changes were 'ambiguous' in nature (e.g., sleeps more, angers quickly, lacks motivation) in that they could be attributed to either the head injury or to adolescence. When presented with an accompanying photo of the adolescent wearing a bandage, participants were more likely to attribute these ambiguous behaviours to both the head injury and adolescence, but when the photo was presented of the adolescent without a bandage, participants ignored the information about head injury and attributed these behaviours to adolescence. Thus, the visible marker of injury (the bandage) was important to recognising the symptoms associated with brain injury, and without, the ambiguous behaviours were attributed solely to adolescence (McClure et al., 2006). Consequently, the absence of a physical outward manifestation of injury may lead an observer's failure to recognise any TBI injury or impact of injury on a person.

So far, research concerning perceptions of brain injury has predominantly focused on knowledge, with little attention paid to exploring *attitudes* towards brain injury (see Chapter 2). Therefore, exploratory analyses were also conducted on the BIAS20 for both professional and lay populations. Overall, both professionals and laypersons held positive attitudes towards those with brain injury on 15 items of the BIAS20, and these included all items pertaining to social inclusion. However, professionals generally held more positive views in respect to 'Social inclusion.' In contrast, attitudes did not differ between professionals and lay persons on the remaining three subscales (‘Empathy,’ ‘Genuineness’ and ‘Risk and dangerousness’). Furthermore, higher scores on the BIAS20 ‘Social inclusion’ were found in participants who had higher levels of proximity to brain injury. Thus, given that the professional sample had higher levels of proximity to brain injury based on their LOC rankings and lay population mostly fell into the ‘Low’ LOC category (see Chapter 4), it is possible that more socially inclusive attitudes are held by those where greater familiarity and proximity to brain injury occurs. Notably, proximity to brain injury may also explain why professionals were more likely to endorse negative and neutral responses to some items (i.e., scoring below the midpoint of 4 of the scale). For example, given the professional context, it is plausible that professionals would be less likely to be upset by meeting a person with a brain injury than a layperson, who may experience less exposure to brain injury in their daily life.

Further comparisons can be drawn from research conducted in other health contexts, where more favourable attitudes towards certain groups have been found when those with higher levels of familiarity and exposure are considered. For example, mental health professionals were more likely than lay persons to report attitudes favouring social inclusion (e.g., willing to accept individual as a family member/employee) in relation to individuals with schizophrenia (e.g., Grasberger et al., 2007), somewhat thematically overlapping with the BIAS20 social inclusion scale. However, such findings are mixed, with other research equally showing that professionals endorse attitudes favouring social distancing (e.g., expressed unwillingness to recommend the individual for a job/or rent a room to the individual) akin to laypersons, when responding to vignettes describing an individual with schizophrenia (e.g., Lauber et al., 2006). Across the three remaining BIAS20 subscales (‘Empathy’, ‘Risk and dangerousness' and 'Genuineness'), differences were observed across individual items but these were not sufficiently large to create statistically significant differences in subscale scores. By way of comparison, Irwin and Fortune (2014) found that familiarity with brain injury did not affect Social Restrictiveness (i.e., dangerousness and avoidance attitudes) or Benevolence (i.e., more sympathetic attitudes) in adolescents, broadly similar to the findings here for the Empathy and Risk and dangerousness subscales.

The findings presented here indicate that professional understanding of brain injury alone does not necessarily lead to more positive attitudes towards individuals with brain injury. This means that other important factors may be more influential in determining attitudes towards individuals with brain injury. For example, scores on the BIAS20 showed that female participants had higher average scores on the Empathy subscale than male participants, similar to Irwin and Fortune's (2014) finding that Benevolence attitudes were more positive in females and Social Restrictiveness attitudes were more negative in males. Such findings are consistent with wider research on gender differences in empathy, whereby females are typically reported as having higher empathy levels than males (e.g., Baron-Cohen & Wheelwright, 2004; Jolliffe & Farrington, 2006; Reniers et al., 2011).

5.4.1 Conclusion

In conclusion, although the scale dimensionality of the PBIM36 and BIAS20 requires further investigation, this Chapter has focused on conducting further in depth exploratory analysis on the PBIM36 and BIAS20 to evaluate the similarities and differences between lay people and professionals in both knowledge- and attitude-based perceptions of individuals with brain injury. For the BIAS20, only social inclusivity was found to be different amongst laypersons and professionals, with the latter group holding more positive attitudes than laypersons for this Social inclusion subscale. In respect of the PBIM36, knowledge- based perceptions were consistently more accurate in the professional sample compared to the lay population sample. Key differences were found in perceptions focusing on the process of recovery, with laypersons more likely to endorse views that linked overall recovery from brain injury to the same trajectory as physical recovery.

Laypersons thus expect a physical signal to identify TBI-disability, and that the recovery process from the hidden symptoms of TBI mirror those of physical recovery. Consequently, perception-based experimental research needs to consider the potential impact of these expectations around recovery, such as aligning research questions to explore how such perceptions may underpin important societal decisions which concern survivors of TBI (e.g., decisions around employment, education and legal proceedings). Indeed, prior research has tended to focus on exploring what the main misconceptions of TBI amongst laypersons are (e.g., Gouvier et al., 1988; Hux et al. 2006), rather than considering what the possible impacts of these misperceptions might be. For instance, how individuals with TBI who offend are perceived in the context of a UK magistrates' court, and how information about TBI is considered in subsequent decision making.

To address this experimentally, findings that laypersons may expect recovery from the hidden cognitive, emotional, and social impacts of brain injury to occur concurrently with physical recovery, and that lay people expect to see a physical indicator of disability, will be further explored in the first experimental Chapter of this thesis (Chapter 6). Specifically, given the high rates of TBI amongst prison populations (e.g., Farrer & Hedges, 2011; Hughes et al., 2015; Pitman et al., 2015; Shiroma et al., 2010; H. Williams, 2012; W.H. Williams et al., 2018) and limited evidence exploring perceptions of TBI amongst defendants in the CJS, the study will evaluate how varying information about TBI impacts on sentencing recommendations when defendants are presented with a history of TBI.

Chapter 5: Key Messages

- Exploratory analysis was conducted to provide an in-depth exploration of professional and laypersons knowledge- and attitude-based perceptions of brain injury.
- Compared to lay persons, professionals held more socially inclusive attitudes towards those with brain injury, but findings were mixed when other attitudes, namely empathy, genuineness, and risk were considered.
- Professionals held more accurate knowledge of brain injury than lay persons. The greatest differences were observed on perceptions centred around understanding of the process of recovery following brain injury. Reflecting themes in prior research, laypersons anticipated recovery from the effects of brain injury to mirror those of physical recovery.
- Drawing on these findings Chapter 6 will explore the effect of a physical marker of TBI to signify the presence of TBI disability on sentencing recommendations in a sample of 'mock' legal decision makers in the context of a magistrates' court.

Chapter 6 Experiment 1

Traumatic Brain Injury (TBI) as a Mitigating Factor in the Magistrates' Court: The Effects of Injury Presentation.

6.1 Chapter Overview

Within the criminal justice system (CJS) most research has focused on determining the prevalence of TBI in prison populations (e.g., Farrer & Hedges, 2011; Hughes et al., 2015; Pitman et al., 2015; Shiroma et al., 2010; H. Williams, 2012; W.H. Williams et al., 2018), as well as exploring the mechanisms that may explain the association between TBI and offending behaviour (see C. Williams et al., 2020; H. Williams et al., 2018). However, little is known about how defendants with TBI are identified and managed *earlier* in the Criminal Justice System (CJS) pathway, and how societal (mis)understanding of TBI may affect the management and treatment of people who have offended. Though people who have offended with a history of TBI may report their injury during early contact with key decision makers in the CJS, it is rarely taken into consideration during interviews and criminal sentencing (Menon & Bryant, 2019). This lack of consideration may be due to inadequate screening practices and/or insufficient understanding of TBI. Given such high prevalence rates of TBI in prison populations (Farrer & Hedges, 2011; Hughes et al., 2015; Shiroma et al., 2010), as well as subsequent high risk of reoffending (Ray & Richardson, 2017), greater focus on TBI is needed much earlier in the CJS pathway.

Very little research has directly examined the role that perceptions of brain injury play in key legal decisions, including sentencing decisions. In layperson and non-expert populations, there is clear evidence that misconceptions exist about the long-term psychosocial consequences of TBI, with expectations that recovery from the hidden cognitive, emotional, and social consequences of TBI will follow the same trajectory as physical recovery (see Chapters 3 and 6). Furthermore, the absence of a physical marker of a TBI may mean that behaviours associated with TBI disability are misattributed to other causes, including age and personality as requisite examples (see McClure, 2011). Therefore, the overarching aim of this Chapter is to investigate how a defendant who is presented with a history of TBI is evaluated in the CJS. Specifically, this Chapter explores how a physical marker of TBI disability, alongside the time course of physical recovery following TBI, may affect 'mock' legal decision makers' perceptions of a fictional magistrates' sentencing decision.

6.2 Understanding the Social Context of TBI in the Criminal Justice System

As covered in Chapter 2, members of the general public hold significant misconceptions about the nature of TBI and its resultant impacts (e.g., Gouvier et al., 1988; Hux et al., 2006; Willer et al., 1993), with a lack of awareness and understanding of TBI also extending to healthcare professionals working with prison populations (Yuhasz, 2013), police custody staff (McMillan, 2022) and individuals working in probation services (O'Rourke et al., 2018a). For example, utilising Gouvier et al.'s (1988) 25-item knowledge of TBI survey, Yuhasz (2013) found that health professionals (e.g., social workers, psychologists, nurses) working within the prison sector in the US held multiple misconceptions about TBI. Indeed, whilst misconception rates differed across those who reported receiving some training on TBI or had prior familiarity with brain injury, most participants still held multiple misconceptions about TBI. Additionally, Yuhasz (2013) also found that 65.8% of health professionals felt that they had received inadequate training to work with prisoners with a history of TBI, with similar findings reported elsewhere. For instance, O'Rourke et al. (2018a) evaluated probation officers' perceptions of brain injury in Northern Ireland, finding evidence of significant training deficits around the nature of TBI. Whilst 77% of probation officers reported working with people who have offended with a history of brain injury, only 7.7.% reported having received some form of training about TBI. Consequently, poor awareness of TBI, coupled with inadequate training, a lack of screening, and poor access to treatment, likely poses significant barriers for those with TBI who enter the CJS.

Consistent with this view, a key recommendation outlined in the 2018 and 2021 'Acquired Brain Injury and Neurorehabilitation: Time for Change' reports produced by the All-Party Parliamentary Group on Acquired Brain Injury (UKABIF, 2018; UKABIF, 2021) is that early screening at entry point to the CJS is needed, together with educational training for key decision-makers and those working with people who have offended. That is, individuals working within the CJS must be able to recognise and accommodate the difficulties faced by those with TBI-related disability (e.g., poor levels of concentration and attention, behavioural challenges, and emotional disruption), as misinterpretations of behaviour in people who have offended with a history of TBI may also increase the risk of further penalties and inappropriate interventions (UAKBIF, 2018). However, the specific needs of defendants with TBI disability are frequently not addressed in the CJS, further exacerbating the problem (UAKBIF, 2018). Thus, one of the key challenges posed to the CJS is drawing key legal decision-makers' attention to the defendant's TBI disability so that it is fully factored into key legal decisions, such as sentencing decisions.

However, even when attention is drawn to a defendant's TBI, legal decision makers may be unable to fully take account of this information because of common misconceptions of brain injury, which are further confounded by its hidden nature (see Chapters 3 and 6). Behaviour can easily be misattributed to other causes and in the absence of a physical marker of disability, the ongoing effects of TBI are often discounted (McClure, 2011; McClure et al., 2006). This finding is supported by Swift and Wilson's (2001) qualitative study, which highlighted how the difficulties and challenges associated with TBI disability are often trivialised by others. For example, one participant, whose spouse had a brain injury, reported a negative experience with a non- expert health professional who recognised the symptoms associated with brain injury, but critically, failed to understand the severity and impact of symptoms on everyday life. Furthermore, without a physical outward marker and/or signal to indicate the presence of TBI disability, expectations of behaviour are often similar to those without TBI (Swift & Wilson, 2001), thus creating a clear disadvantage for those with TBI disability. To mitigate some of these misattributions, one study found that presenting normative information about a person's behaviour pre- and post-injury led to a higher likelihood that behaviour was correctly attributed to the TBI disability (McClure & Abbott, 2009). Even so, TBI disability largely remains an invisible disability to observers, which can lead to an expectation of 'normal' behaviour when visible physical markers of injury are absent (Swift & Wilson, 2001).

Furthermore, in addition to the expectation that TBI-related disability is accompanied by a physical marker, observers may also expect that recovery from the emotional and cognitive consequences of TBI will follow the same trajectory as physical recovery (see also Chapter 5). However, the cognitive and social consequences of TBI typically persist, even after a good physical recovery has been achieved. This mismatch between laypersons' intuitions and the lived reality of people with TBI was highlighted in previous chapters (e.g., Chapter 5). Indeed, the largest discrepancies between laypersons and brain injury professionals was seen in the 'Physical and medical expectations' and 'Signs and symptoms of brain injury' subscales of the PBIM (Chapter 5). These two subscales included items focusing on the relationship between physical recovery and expectations of recovery from the hidden consequences of TBI (e.g., '*Physical, memory and social recovery occur at the same rate following brain injury*;' '*Physical recovery from brain injury is a good indicator of overall recovery'*). In the context of the CJS therefore, it is also important to evaluate how key legal decisions around sentencing are influenced by the perceived or expected trajectory of physical recovery after TBI, whereby accompanying physical problems to other, more hidden symptoms, may be acting as a visible marker for TBI disability.

6.3 Legal Decision-Making Research

Although, before exploring the effect of visible marker/s of TBI disability on perceptions of defendants, it is first necessary to explore research designs commonly used to examine how defendants are perceived, but also how trial information is evaluated to inform subsequent verdict/sentencing decisions. In psychology, considerable attention has been paid to how jurors, who are typically involved in adjudicating the most serious crimes (e.g., murder trials), use case information and available evidence to deliberate on trials and make recommendations (see Schweitzer & Nuñez, 2018). In research, individual cognitive processes and the attitudes (e.g., general legal opinions, attitudes towards mental illness) held by key legal decision makers have been examined to identify how they may influence subsequent legal decisions, such as determining the guilt or innocence of the defendant (Bornstein & Greene, 2011; de la Fuente et al., 2003; Mobbs et al., 2007; Mossière & Maeder, 2015). For this, research typically relies on mock juror studies (i.e., jury simulations in fictional scenario-based research), and although such research designs are criticised for lacking ecological validity (e.g., reliance on student samples, based on individual decisions rather than group deliberation), they offer a high degree of experimental control (see Bornstein et al., 2017).

As such, mock jury research has not only been used to investigate the process and outcome of legal decisions but has also provided useful insights into how individual factors (e.g., perceptions, attitudes) influence the juror's verdict or decision (Bornstein et al., 2017). For example, mock juror research has been conducted to investigate jurors' perceptions of the relative importance of different types of trial evidence, including expert and eye-witness testimony, DNA evidence and photographic evidence (Schweitzer & Nuñez, 2018). Other mock juror research has investigated perceptions of criminal responsibility when a defendant is presented with a mental illness (Jung, 2015). For example, Jung (2015) not only evaluated how the trial information they presented influenced the verdict decision, but also how attitudes towards the defendant's mental illness and legal opinions towards the insanity defense contributed to the juror's verdict. Along with perceptions pertaining to individual characteristics of the defendants (e.g., measuring attitudes towards mental illness; Jung, 2015; Mossiere & Maeder, 2015), pre-existing biases, such as pre-trial pro-prosecution attitudes and bias for forensic evidence have also been previously reported as important extra-legal considerations in juror research that can exert an influence on jurors' verdicts (de la Fuente et al., 2003; L.L. Smith & Bull, 2012). Thus, research simulations using fictional scenarios have been invaluable in investigating factors influencing legal decisions.

6.4 Neuropsychological Evidence: Verdicts and Sentencing

It is important to consider what evidence is presented in court about TBI and how this may impact on the key decision makers, whether in relation to verdict and sentencing decisions, or risk and management. Damage to the pre-frontal cortex has long been associated with behaviours (e.g., lack or reasoning, behavioural disinhibition, lack of empathy) that makes criminality more likely (Mobbs et al., 2007). Consequently, researchers have explored whether different types of evidence supporting the presence of brain lesions/injuries affect the perceived culpability of a defendant (e.g., Greene & Cahill, 2012). For example, Gurley and Marcus (2008) investigated the types of evidence (e.g., neuroimaging, testimonial of a TBI) which may influence jurors' verdicts (not guilty by reason of insanity [NGRI], guilty) in a fictional murder trial where the defendant was described as having a mental disorder (psychosis or psychopathy). To evaluate trial evidence, two forms of evidence were also included in this study. The first type of evidence included information about a TBI event (the defendant had sustained a TBI in a car accident 6 months prior to the crime) or no TBI event (onset of symptoms reported during adolescence). The second form of evidence included the presentation of four neuroimages (i.e., MRI scans) indicating damage to the pre-frontal cortex, which were either present or absent from the evidence presented to participants. Participants who viewed neuroimages were additionally informed that the brain damage likely impacted the defendant's ability to exert behavioural control. Findings revealed that a verdict of NGRI was more likely when the defendant's mental disorder was described as psychosis (OR = 1.44), when neuroimages were included (OR = 1.34) and when a TBI event was described (OR = 1.61). Furthermore, NGRI verdicts were given by 47% of participants presented with both forms of trial evidence (i.e., neuroimages and TBI information), compared to 31.6% participants who only viewed one form of trial evidence (i.e., either neuroimages or TBI information). Thus, a description of the defendant's TBI and neuroimaging evidence increased the likelihood that jurors would deliver a NGRI verdict and therefore, a less severe verdict decision.

However, in Gurley and Marcus' (2008) study, TBI was not considered independently of the defendant's mental disorder as the TBI information was only presented after the defendant's mental disorder (i.e., psychosis or psychopathy) had been described. Thus, it is not possible to isolate the effects of the defendant's TBI status on the juror's verdict decisions. Even so, other research has also found that neuroimaging evidence influences juror's verdict decision. Saks et al. (2014) explored the influence of different types of expert evidence (e.g., clinical, neuroimages, genetic) on capital punishment (i.e., the death penalty) verdict decisions. Overall, neuroimages were found to strengthen the argument of either the defense (i.e., when it was presented as mitigating evidence) or prosecution (i.e., where it was presented as aggravating evidence), but a reverse effect was found when other expert evidence was presented (e.g., clinical, genetic) instead of neuroimaging (Saks et al., 2014). Thus, neuroimaging evidence appears to have high probative value and a persuasive effect on jurors' verdict decisions, serving to strengthen arguments that are presented about the defendant (T. Brown & Murphy, 2010; Saks et al., 2014).

The finding that neuroimages are a persuasive form of evidence is important because their value as trial evidence is questionable (T. Brown & Murphy, 2010; Hardcastle, 2015). In the courtroom, brain scans, which include different types of neuroimaging techniques (e.g., fMRI, MRI, CT scans), are increasingly being presented as mitigating evidence to explain a defendants' behaviour. Thus, they may form an important component of the defences argument (Hardcastle, 2015). However, brain scans are not considered a reliable metric amongst the scientific community for evidencing TBI disability in court settings, despite their influence over verdict and sentencing decisions (Gurley & Marcus, 2008; Hardcastle 2015; Saks et al., 2014). This is partly owing to their inability to provide information about a defendant's previous mental state at the time the offence was committed, but also because interpretation is limited, particularly in an absence of additional information directly linking damage to the brain to the behaviour of the defendant (T. Brown & Murphy, 2010; Hardcastle, 2015). Despite such limitations though, it is nevertheless important to recognise that legal decision-makers may be prejudiced by neuroimaging evidence due to the 'Christmas tree effect' (i.e., the brain image exerts a powerful effect on the juror's decision) leading it to have higher probative value (T. Brown & Murphy, 2010; Hardcastle, 2015; Sinnott-Armstrong et al., 2008).

The inclusion of neuroimaging evidence in trial information not only influences sentencing recommendations but can also affect perceptions of the defendant's future dangerousness. For example, Greene and Cahill (2012) found that a defendant (diagnosed with psychosis) considered to be at high risk of future dangerousness was much more likely to be sentenced to death when no accompanying neuroimaging evidence indicated prior brain injury (OR = 21.54) or when neuropsychological evidence (OR = 11.54) alone was presented. However, when the defendant was described as low risk for future dangerousness, diagnosis only, neuropsychological, and neuroimaging evidence types all had a similar mitigating effect (Green & Cahill, 2012). This study highlights the value of other forms of evidence (than neuroimaging) that may also be influential in legal decisions, and similarly, how perceived levels of future dangerousness – inferred via behavioural interpretations of the defendant – may further impact on sentencing verdicts. However, whilst such studies are useful in determining the potential probative effects of neurological evidence on decision making in comparison to other forms of evidence, they do not specifically focus on the context of TBI disability in trial deliberations. That is, they merely present such evidence to provide a physical/medical basis to a defendant's existing disorder (e.g., psychopathy, psychosis).

6.5 The Effect of TBI on Legal Decisions: Perceptions and Evaluations of Brain Injury Information

Whilst jurors' perceptions of neuroimaging evidence have been important to understand their influence on verdict decisions, attention needs to be paid to specifically exploring perceptions of defendants with a TBI disability. For example, St Pierre and Parente (2016) investigated perceptions of the morality (i.e., justifiable, acceptable, and ethical) of the defendant's alleged crime, levels of guilt (i.e., at fault, liable, and guilty), and sentencing recommendations when a defendant was presented as having sustained a mild or severe TBI, or no TBI. Here, participants were presented with one fictional crime condition to investigate the effect of crime severity, either a murder case or assault case, but for each of these crimes, three different defendants (either described as having a mild or severe TBI, or no TBI) were presented as a measure of brain injury severity. Irrespective of crime severity, a higher morality rating was given to the defendant with severe TBI compared to either mild or no TBI. Guilt ratings were also significantly lower overall for those with severe TBI compared to no TBI, but there was also a significant interaction between TBI presentation and crime severity. Namely, the defendant with severe TBI was judged to be less guilty than the defendant with mild or no TBI, but only for the crime of murder. Furthermore, and independent of crime severity, punishment ratings were also lower overall for the defendant with severe TBI than mild and no TBI. Although, a significant TBI presentation by crime severity interaction revealed that this was only the case for murder. Finally, recommended punishments also tended to be less severe for the defendant presented with a severe TBI and were more likely to involve rehabilitation recommendations.

However, a potential confounding factor in the study's design was that each participant was assigned to one crime condition but rated all three defendants. Prior to taking part, participants were also made aware that the aim of the study was to explore 'judgmental biases' and perceptions of guilt of defendants with a history of brain injury, potentially impacting participants responses. To address some of these concerns, St Pierre and Parente (2016) conducted a second experiment in which participants rated a single defendant (again with severe TBI, mild TBI or no TBI) from one crime scenario (murder or assault). The results were not entirely consistent with those of the first experiment. Specifically, even though rehabilitation was again more likely to be recommended for the defendant with severe TBI, the defendant with mild TBI received the highest morality ratings, while guilt ratings did not significantly differ across defendants. Thus, drawing firm conclusions across the two studies is difficult. Further, whilst these findings offer important insights into how participants perceive defendants with brain injury in the context of a criminal trial, the studies did not take account of extra-legal considerations such as existing pre-trial attitudes (e.g., Jung, 2015), nor consider perceptions of the defendants' dangerousness (Greene & Cahill, 2012).

In sum, much attention has been paid to how neurological evidence influences sentencing verdicts, but their use tends to focus on providing a physical presence of another disorder (e.g., psychopathy, psychosis, e.g., Greene and Cahill, 2012) in order to evaluate if this strengthens evidence sufficiently to influence subsequent sentencing verdicts and recommendations. However, little research has directly examined how jurors perceive TBI disability, and although St Pierre and Parente (2016) explored the effect of TBI severity on morality and guilt ratings, other considerations such as familiarity with and proximity to brain injury, perception of risk and dangerousness, and knowledge of, and attitudes towards, brain injury - as well as other potentially relevant factors such as general legal opinions - were not considered. Aside from this, other limitations of these studies, including Green and Cahill's (2012) research, is that decisions concerning capital punishment (i.e., the death penalty; Green & Cahill, 2012) were investigated, thereby limiting its relevance to the UK Court System. Additionally, mock juror research can only focus on a small proportion of crimes, and notably the most serious cases committed by people who have offended, because only 5-10% of crimes are trials by jury. In the UK, most criminal cases are not only adjudicated in a magistrates' court, but approximately 95% are also completed there (Courts and Tribunals Judiciary, 2022b). Therefore, research exploring sentencing decisions about defendants with a history of TBI in the context of the magistrates' court are sorely needed.

6.6 A Magistrates' Role and Sentencing Powers

In the UK, magistrates are trained members of the community who sit in their role in a voluntary capacity (Courts and Tribunals Judiciary, 2022b), meaning that defendants are tried by their community peers. A magistrate deals with three types of offences: (1) Summary offences, which are the least serious offences (e.g., motoring offences and some common assaults); (2) Either-way offences, which can either be trialed in the magistrates' court or in the Crown Court (e.g., theft, handling stolen goods), and (3) Indictable offences, which are the most serious offences (e.g., such as murder, robbery). For indictable offences, a magistrates' role is to consider bail conditions and possible reporting restrictions before passing the case to the Crown Court.

The Sentencing Council outlines the four types of sentences that can be imposed by judges and magistrates: (1) Discharge; (2) Fine; (3) Community Sentence and (4) Custodial sentence. Drawing on available Sentencing Guidelines which are set by the UK Sentencing Council for each offence (Sentencing Council n.d.,b). Magistrates' have powers to sentence a defendant to six-months imprisonment for a single offence (12 months in total for multiple offences). Magistrates also have to determine the seriousness of each individual offence, factoring in the *harm* caused by a defendant, as well as the defendant's *culpability,* and then consider this when reaching a sentencing decision. When assessing culpability, personal circumstances - including disability - can be considered as mitigating factors (Sentencing – Sentencing Council, n.d., a) and then if taken into account, may serve to reduce the perceived culpability of the defendant, and in turn, the sentencing recommendation.

6.7 Development of Fictional Case Materials

6.7.1 Legal Framework

This study aimed to present participants with fictional sentencing remarks, ostensibly from a magistrates' court, ensuring maximal relevance to the UK court system. An example case from the sentencing council (https://www.sentencingcouncil.org.uk/publications/item/scenario-sentencing-process-for-fictional-abh-offence/, accessed September 2019) served as a template. Input was also sought from a Magistrate to ensure that the materials accurately reflected the deliberation process that takes place within a magistrates' court.

6.7.2 Case Development of Fictional Magistrates' Sentencing Remarks

The materials described the fictional case of male defendant, aged 23, who had pleaded guilty to assaulting a 26-year-old male victim. As a result, the defendant had been charged with the offence of Assault Occasioning Actual Bodily Harm, contrary to section 47 of the Offences against the Person Act 1861. This type of offence was chosen because it was appropriate for a magistrates' court and because it represents the type of crime (violent crime and assaults) most commonly committed by people who have offended with a history of TBI (see Ray & Richardson, 2017). The materials described an assault which took place in a snooker club during the night of 25th May 2019. The materials described how an argument broke out between one of the defendant's friends and the victim, leading the defendant to join the argument and then physically assault the victim.

Reflecting the factors that a magistrate would consider for their sentencing verdict, the fictional sentencing remarks developed here, capture three aggravating and three mitigating factors (https://www.sentencingcouncil.org.uk/publications/item/scenario-sentencing-process-for-fictional-abh-offence/ accessed September 2019). The aggravating factors outlined the harm that had been caused by the offence, while the mitigating factors focused on the culpability of the defendant. The three aggravating factors were: (1) the defendant repeatedly punched the victim; (2) it was an unprovoked attack; and (3) the defendant caused significant harm to the victim because the victim was left with permanent scarring and broken teeth which were in need of ongoing treatment. In contrast, the mitigating factors were: (1) it was the defendant's first offence; (2) the defendant pleaded guilty at the earliest opportunity; and (3) the offence was not pre-meditated (see Appendix Rfor fictional magistrates sentencing remarks).

6.7.3 Sentencing Options Available to the Magistrate in the Fictional Sentencing Remarks

The above factors meet the criteria for a category 2 offence (greater harm and lower culpability), whereby a range of sentencing options are available to a magistrate which start from a low-level community order and go up to a 51-week custodial sentence. The specific sentencing options available to magistrates for a category 2 offence, including the assault case described here, are: (1) Low-level community order (40-300 hours); (2) A suspended prison sentence of up to 26 weeks (suspension period of 6-24 months); (3)

A custodial sentence of up to 26 weeks, and (4) referral to the Crown Courts (sentencing up to 51 weeks). In the development phases of the research, a 13-week custodial sentence was imposed. However, a pilot study was first conducted to test the suitability of the fictional magistrates' sentencing remarks for experimentation.

Pilot Study 1: Fictional Magistrates' Sentencing Remarks Materials: Evaluation of Floor and Ceiling Effects

6.8 Study Aims

A pilot test was first conducted to evaluate participants' responses to the magistrates' sentencing verdict, absent of any introduction of TBI-related information. Specifically, the first pilot was designed to test for ceiling or floor effects in the key dependent variables: (1) perceived appropriateness of the magistrates' sentencing verdict; (2) recommended sentence. A further aim was to evaluate how accurately participants responded to attentional control check questions. The materials tested here, which contained no additional information about TBI, would then form the no-TBI (control condition) in the main study.

6.9 Methods

6.9.1 Participants

The study was advertised as ‘Legal decision making in the magistrates’ court’ through the online participant recruitment platform 'Prolific' (www.prolific.co). Participants were pre-screened through the Prolific site to ensure that they met the following eligibility criteria: (1) first language English; (2) minimum age of 18, and (3) had a minimum approval rating of 90% on the Prolific site (i.e., at least 90% of their previous Prolific submissions had been approved). Participants were paid £1.25 for participating. A total of 40 participants completed the study and of these, 28 (70%) were female and age ranged from 18 – 68 years (*M* = 34.78, *SD* = 12.41). See Table 6.1 for further demographic information.

Table 6.1

Summary of Demographic Characteristics

Demographic characteristics		Prolific Sample (n = 40)	
		n	%
Gender			
	Male	12	30.0%
	Female	28	70.0%
Ethnicity			
	White	36	90.0%
	Multiple ethnic groups	1	2.5%
	Asian	2	5.0%
	African	1	2.5%
Educational attainment			
	Secondary School	9	22.5%
	Sixth form/ college	8	20.0%
	First degree	16	40.0%
	Master’s degree	4	10.0%
	PhD/ Doctorate	2	5.0%
	Other	1	2.5%
Employment status			
	Full time employment	20	50.0%
	Part-time employment	12	30.0%
	Retired	1	2.5%

Unpaid carer	1	2.5%
Not working due to disability/health reasons	2	5.0%
Full time student	4	10.0%
Country of residence		
Australia	1	2.5%
Canada	1	2.5%
United Kingdom	37	92.5%
USA	1	2.5%

6.9.2 Design

This study did not include any independent variables. Three key measures were included to assess participants' responses to the magistrates' case materials and sentencing verdict. First, participants rated the appropriateness of the magistrate's sentencing verdict (Appropriateness of Sentencing) which would form the central dependent variable for hypothesis testing in subsequent experimental testing. Second, participants recommended a sentence by selecting one of the four 'Sentencing Options' categories available to the magistrate for this offence. After selecting their preferred sentencing option, participants were asked a follow up question so they could indicate their preferred length of sentence relevant to their chosen sentencing category. Third, participants rated how influential they considered each of the aggravating and mitigating factors to be. Attentional control check questions were also included to assess response accuracy in preparation for their possible inclusion in the main study as data quality controls.

6.9.3 Materials

6.9.3.1 Fictional Magistrates' Sentencing Remarks and Verdict

The fictional magistrates' scenario (see section *6.7* Development of Fictional Sentencing Remarks and Appendix R) was presented, including aggravating and mitigating factors relevant to the case. In line with the sentencing options available to the magistrate for the crime committed by the defendant, a sentencing verdict of a 13-week custodial sentence was given.

6.9.3.2 Piloted Variables: Appropriateness of Sentencing, Sentencing Options and Consideration of Factors.

The first 'Appropriateness of Sentencing' variable was included to measure participants' perceptions of whether the magistrates' recommended sentence was either too harsh or too lenient. For this, a 7-point scale was adopted whereby 1 = Much too lenient, 2 = Moderately too lenient, 3 = Slightly too lenient, 4 = Neither too lenient nor too harsh, 5= Slightly too harsh, 6 = Moderately too harsh, and 7 = Much too harsh. Higher scores on this scale indicated that participants considered the defendant's sentence too harsh.

The second 'Sentencing Options' variable measured the sentencing option that the participant considered to be the most appropriate for the defendant. The 'Sentencing Options' variable contained four categories: (1) A low level community order (whereby the defendant would be required to carry out community service for between 40-300 hours); (2) A suspended custodial sentence of up to 26 weeks (with a suspended period of between 6-24 months); (3) A custodial (prison) sentence (between 1 – 26 weeks) and (4) Referral to the Crown Court for custodial sentences beyond 26 weeks. After the participant had chosen their preferred sentencing category, a follow up question was asked to allow participants to indicate their preferred length of sentence (on a sliding scale) conforming to sentencing recommendations available for each option. For example, if the participant selected a custodial sentence of between 1- 26 weeks as their preferred sentencing option, a follow up question was presented asking the participant to indicate their preferred length of sentence (in weeks) on a sliding scale, which ranged from 1 – 26 weeks. This was presented in: (1) increments of 20 hours for a Community Order (between 40-300 hours); (2) increments of one month for a suspended sentence (between 6-24 months), and (3) increments of one week for custodial prisons sentences (between 1-26 weeks for option 3 and 27-51 weeks for option 4).

Third, a set of six 'Consideration of Factors' variables were included to measure how influential each of the individual aggravating and mitigating factors were in the participants own sentencing recommendation. To do this, the original aggravating and mitigating factors presented in the case materials were presented to participants as questions. This was rated on a 5-point scale, where 1 = Not at all influential, 2 = Slightly influential, 3 = Moderately influential, 4 = Very influential, and 5 = Extremely influential.

6.9.3.3 Attentional Control Check Questions

Three attentional control check questions were developed, and their validity evaluated. These were: (1) *Where did the assault take place?*'; (2) '*What injury did the victim suffer?*', and (3) '*How many weeks did the magistrate sentence the defendant to?'*. For each attentional control check question, participants selected one of four multiple choice answers, whereby one was correct and the remaining three were false (see section 6.14.4 for further details).

6.9.4 Procedure

Ethical approval was granted by Swansea University's Department (now 'School') of Psychology Research Ethics Committee (reference: 1534; see Appendix S). The study was advertised as 'Legal decision making in the magistrates' court' through the 'Prolific' online platform (www.prolific.co), whereby participants were directed to the online study platform 'Qualtrics' in order to participate. Participants were informed that the purpose of the study was to explore decision-making processes in the magistrates' court system and what factors affected those decisions. They were told that the study would take approximately 15 minutes to complete. On clicking through to the study, participants were presented with the information page outlining the purpose of this research, what would happen to them if they took part, and relevant data protection and confidentiality arrangements. Next, participants were presented with a consent page whereby they provided content via a checkbox. After this, participants were first asked to enter their Prolific ID (a requirement of the platform) and were asked to answer standard demographic questions.

Next, participants were presented with the magistrates' summary of the case (Appendix R). This was followed by the aggravating and mitigating factors, which were presented in a counterbalanced order (i.e., aggravating factors first or mitigating factors first). Participants then read the UK Sentencing Guidelines for this type of offence, followed by the magistrate's sentencing verdict. To minimise the risk of skim reading, the information was split across four pages. Each page was also set to a timer, meaning that participants could not advance to the next page until the time had elapsed. Timers were set at half of the estimated reading time, calculated using the website https://niram.org/read/.

Next, participants rated the appropriateness of the verdict and indicated their preferred sentencing option (post-verdict decision). Participants then rated the influence of each of the aggravating and mitigating factors on their decision-making, in a randomised order. To assess whether participants' view would shift after explicitly reflecting on each of the aggravating and mitigating factors, participants were presented with a reminder of the magistrates' sentencing verdict and asked, once more, to rate the appropriateness of the verdict and to indicate their preferred sentence (post-rating decision). Participants then completed the three attentional control check questions before being presented with a comprehensive debrief page. In the latter, participants were informed that the study was investigating the factors involved in legal decision making and that their responses would help inform the development of the scenario. Participants were signposted to members of the research team, their GP or relevant support services, and were thanked for their time.

6.10 Results

6.10.1 Appropriateness of Sentencing

Descriptive statistics were calculated for the 'Appropriateness of Sentencing' variable, measured immediately after the magistrate's sentencing verdict (post-verdict), and also following participants evaluation of each of the aggravating and mitigating factors (post- rating). Generally, participants considered the magistrate's verdict too harsh, and this was found post-verdict and post-rating (see Table 6.2). See Appendix T for histograms of each decision timepoint (post-verdict and post-rating).

Table 6.2

Descriptive Statistics for the Appropriate of Sentencing Recommendation - Post-Verdict and Post-Rating

Descriptives Scale points	**Appropriateness of sentencing post-verdict**	**Appropriateness of sentencing post-rating**
Mean	4.85	4.75
Mode	5	5
Median	5	5
Scale point n (%, cumulative %)		
Much too lenient	0 (0.0%, 0.0%)	0.0 (0.0%, 0.0%)
Moderately too lenient	3 (7.5%, 7.5%)	2 (5%, 5%)
Slightly too lenient	1 (2.5%, 10%)	3 (7.5%, 12.5%)
Neither too lenient nor too harsh	8 (20%, 30%)	10 (25%, 37.5%)
Slightly too harsh	17 (42.5%, 72.5%)	15 (37.5%, 75%)
Moderately too harsh	9 (22.5%, 95%)	8 (20%, 95%)
Much too harsh	2 (5%, 100%)	2 (5%, 100%)

6.10.2 Sentencing Options

Descriptive statistics were also calculated for the sentencing options (see Table 6.3). The 'suspended sentence' option had the highest proportion of responses across both timepoints, 'custodial sentence' the least from the options selected, and no participants selected 'referral to the Crown Court' as their preferred sentencing option.

Table 6.3

Descriptive Statistics of Sentencing Options Post-Verdict and Post-Ratings

Sentencing option	Sentencing options post-verdict n (%)	Sentencing options post-rating n (%)
Community order	14 (35%)	13 (32.5%)
Suspended Sentence	17 (42.5%)	17 (42.5%)
Custodial Sentence	9 (22.5%)	10 (25%)
Crown Court	0 (0%)	0 (0%)

6.10.3 Aggravating and Mitigating Factors

The mitigating factor 'first offence' was the most influential factor with the highest mean value and a modal rank of 5 ('Extremely influential'). In contrast, 'Punched the victim three times' and 'Unprovoked attack' were the least influential (see Table 6.4).

Table 6.4

Descriptive Statistics for how Influential each of the Aggravating and Mitigating Factors were in the Participants' Sentencing Ratings

	Aggravating Factors			**Mitigating Factors**		
	Punched victim x 3	**Unprovoked attack**	**Caused harm**	**First offence**	**Low culpability**	**Pleaded guilty**
Mean	3.60	3.60	3.88	4.00	3.85	3.90
Median	4	4	4	4	4	4
Mode	4	3	4	5	4	5
Min	1	1	1	1	1	2
Max	5	5	5	5	5	5

6.10.4 Attentional Control Check Questions

The accuracy of responses to the three-attentional control check questions were also assessed (see Table 6.5) and correct answers are highlighted in bold. The first two questions '*Where did the assault take plac*e?' and '*What injury did the victim suffer?*' both had 97.5% (n = 39) accurate responses. In contrast, a slightly smaller percentage (87.5%) correctly identified that the defendant had been sentenced to 13 weeks imprisonment ('*How many weeks did the magistrate sentence the defendant to?')*, with 12.5% (n= 5) answering incorrectly.

Table 6.5

Response Accuracy for Attentional Control Check Questions

Attentional control check question	**n (40)**	**%**	**Cumulative %**
Where did the assault take place?			
Leisure centre	1	2.5%	2.5%
Outside a pub	0	0.0%	2.5%
Snooker club	39	97.5%	100.0%
Youth club	0	0.0%	100.0%
What injury did the victim suffer?			
Broken nose	1	2.5%	2.5%
Broken teeth	39	97.5%	97.5%
Broken jaw	0	0.0%	100.0%
No injury	0	0.0%	100.0%
How many weeks did the magistrate sentence the defendant to?			
13 weeks	35	87.5%	87.5%
30 weeks	0	0.0%	87.5%
26 weeks	5	12.5%	100.0%
4 weeks	0	0.0	100.0%

6.11 Conclusions

The aim of this pilot study was to evaluate the newly developed fictional sentencing remarks scenario which would then form the control condition (*no-TBI*) for the main study. A key focus was to investigate how participants, who were 'mock' legal decisions makers in this study, responded to the magistrates' own sentencing verdict for both the main dependent variable 'appropriateness of sentencing' and the 'sentencing options' variable. The findings of the study showed that most participants considered the magistrates' sentencing verdict too harsh. Additionally, when participants were asked to indicate their preferred sentencing option, more participants opted for a suspended sentence than a custodial sentence. These results suggested a potential ceiling effect that would limit the ability to detect differences between the control condition (no-TBI) tested here and subsequent experimental manipulations incorporating the presence a TBI as an additional mitigating factor. Examination of participants' recommended sentences suggested that changing the Magistrates' sentencing decision to a suspended custodial sentence could alleviate this issue. Furthermore, given the low response accuracy for one of the attentional control check questions '*how many weeks did the magistrate sentence the defendant to?*', testing an alternative attentional control check question prior to inclusion in the main study would also be useful.

Pilot Study 2

Fictional Magistrates' Sentencing Remarks Materials: Evaluating Participant's Responses to a Lower Sentencing Category

6.12 Study Aims

The aim of this second pilot study was to re-evaluate responses to the fictional magistrates' sentencing remarks, when a reduced sentencing verdict of a suspended sentence was presented. Participants (new sample of 'mock' legal decision makers) were again required to decide on the appropriateness of the magistrates' sentencing verdict (post-verdict and post-ratings) and indicate their preferred sentencing option. Additionally, a new attentional control check question was tested.

6.13 Methods

6.13.1 Participants

The study was advertised on 'Prolific' as 'Legal decision making in the magistrates court'. The same eligibility criteria applied in pilot study 1 was adopted here (see section 6.9.1), with the additional criteria that participants who completed pilot study 1 were excluded from taking part. Participants were paid £1.25 in return for participating. A total of 41 participants completed the study, of whom 56.1% (n = 23) were female and ages ranged from 18 – 66 years (M = 34.29, SD = 12.49). See Table 6.6 below for further demographic information.

Table 6.6

Summary of Demographic Characteristics

Demographic characteristics	Prolific Sample (n = 41)	
	n	**%**
Gender		
Male	18	43.9%
Female	23	56.1%
Ethnicity		
White	37	90.2%
Middle Eastern	1	2.4%
Asian (East and South)	3	7.3%
Educational attainment		
No formal education	1	2.4%
Secondary School	10	24.4%
Sixth form/ college	11	26.8%
First degree	13	31.7%
Master's degree	3	7.3%
PhD/ Doctorate	1	2.4%
Other	2	4.9%
Employment status		
Full time employment	19	46.3%
Part-time employment	3	7.3%
Retired	1	2.4%

Unpaid carer	5	12.2%
Not working due to disability/health reasons	4	9.8%
Full time student	5	12.2%
Part time student	1	2.4%
Country of residence		
Australia	2	4.9%
Canada	1	2.4%
Ireland	1	2.4%
United Kingdom	34	82.9%
USA	3	7.3%

6.13.2 Design

Replicating the design of pilot one, no independent variables were included. Furthermore, the same three measures of 'Appropriateness of Sentencing,' 'Sentencing Options' and 'Consideration of Factors' were included.

6.13.3 Materials

The same fictional scenario of a magistrates' sentencing remarks was used in this study as in the first pilot study (see Appendix R). However, in this pilot, the defendant was sentenced to a *suspended* custodial sentence of 13 weeks, suspended for 12-months. Furthermore, participants were asked the same questions as in pilot study one, with one exception. The third attentional control check question was changed to '*What age was the defendant*?'.

6.13.4 Procedure

Ethical approval was granted by Swansea University's Department (now 'School') of Psychology Research Ethics Committee (reference: 1534; Appendix S). This study followed the same procedure as Pilot Study one (see section 6.9.5 Procedure).

6.14 Results

6.14.1 Appropriateness of Sentencing

Descriptive statistics were calculated for 'Appropriateness of Sentencing' variable (post- verdict and post-rating) and are presented in Table 6.7. Generally, most participants agreed with the magistrates' verdict, with the remaining participants' typically viewing the verdict as lenient immediately following the presentation of the magistrates' verdict (post-verdict) and also after considerations of the aggravating and mitigating factors (post-rating). See Appendix U for histograms of each decision timepoint.

Table 6.7

Descriptive Statistics for the Appropriate of Sentencing Recommendation - Post-Verdict and Post-Rating

Descriptive statistics	Scale point	Appropriateness of sentencing post-verdict	Appropriateness of sentencing post-rating
Mean		3.59	3.54
Mode		4	4
Median		4	4
Scale point n,	(%, cumulative %)		
	Much too lenient	3 (7.3%, 7.3%)	1 (2.4%, 2.4%)
	Moderately too lenient	2 (4.9%, 12.2%)	5 (12.2%, 14.6%)
	Slightly too lenient	7 (17.1%, 29.3%)	9 (22.0%, 36.6%)
	Neither too lenient nor too harsh	27 (65.9%, 95.1%)	24 (58.5%, 95.1%)
	Slightly too harsh	1 (2.4%, 97.6%)	1 (2.4%, 97.6%)
	Moderately too harsh	1 (2.4%, 100%)	1 (2.4%, 100%)
	Much too harsh	0 (0.0%, 100%)	0 (0.0%, 100%)

6.14.2 Sentencing Options

Reflecting the fact that most participants agreed with the magistrates' sentencing verdict in the 'Appropriateness of Sentencing' variable, most participants also selected the 'Suspended sentence' as their preferred sentencing option post-verdict (68.3%) and post-rating (70.7%: see Table 6.8). This was followed by 'Custodial sentence' and then 'Community order.' Only one (2.4%) participant chose 'Referral to the Crown Court' as their preferred sentencing option post-verdict, and no participants selected this option post-rating.

Table 6.8

Descriptive Statistics for Sentencing Options – Post-Verdict and Post-Rating

Sentencing option	Sentencing option post-verdict	Sentencing option post-rating
Community order	5 (12.2%)	4 (9.8%)
Suspended Sentence	28 (68.3%)	29 (70.7%)
Custodial Sentence	7 (17.1%)	8 (19.5%)
Crown Court	1 (2.4%)	0 (0%)

6.14.3 Aggravating and Mitigating Factors

'Caused significant harm' was the most influential factor and 'low culpability' was the least influential (see Table 6.9). In contrast to pilot study one, the aggravating factors in the case materials were more influential in participants sentencing recommendations than the mitigating factors.

Table 6.9

Descriptive Statistics for how Influential each of the Aggravating and Mitigating Factors were in the Participants' Sentencing Ratings

	Aggravating Factors			**Mitigating Factors**		
	Punched victim x 3	**Unprovoked attack**	**Caused harm**	**First offence**	**Low culpability**	**Pleaded guilty**
Mean	3.90	3.76	4.02	3.07	3.00	3.22
Median	4	4	4	3	3	3
Mode	4	4	5	3	3	3[a]
Minimum	1	1	1	1	1	1
Maximum	5	5	5	5	5	5

Note: [a]Multiple mode exist for the 'Pleaded guilty' mitigating factor, mode = 3 and 4.

6.14.4 Attentional Control Check Questions

The accuracy of responses to the three attentional control check questions were also reviewed, and accurate responses are highlighted in bold (see Table 6.10). The first two questions '*Where did the assault take place?*' and *'What injury did the victim suffer?'* had accuracy ratings of 87.8% (n = 35) and 85.4% (n = 35), respectively. For '*What age was the defendant?'*, accuracy was 95.1% (n = 39), representing a substantial improvement over the question it replaced from pilot study one.

Table 6.10

Response Accuracy for Attentional Control Check Questions

Attentional control check questions	**n (41)**	**%**	**Cumulative %**
Where did the assault take place?			
Leisure centre	2	4.9	4.9
Outside a pub	2	4.9	9.8
Snooker club	36	87.8	97.6
Youth club	1	2.4	100.0
Total	41	100.0	
What injury did the victim suffer?			
Broken nose	3	7.3	7.3
Broken teeth	35	85.4	92.7
Broken jaw	1	2.4	95.1
No injury	2	4.9	100.0
What age was the defendant?			
Under 20	1	2.4	2.4
20 - 29	39	95.1	95.1
30 - 39	1	2.4	2.4
40-49	0	0.0	100.0

6.15 Conclusions

The aim of this pilot study was to evaluate how participants, who were ‘mock’ legal decision makers, responded to an amended magistrates’ sentencing verdict in the fictional case scenario, which would then form the no-TBI (control condition) in the main study. In the previous pilot study, most participants considered the magistrates’ sentencing verdict ‘too harsh,’ indicating a potential ceiling effect that needed further investigation. This pilot study found that a more lenient sentencing verdict of a suspended sentence was considered more appropriate by participants. Indeed, most participants also selected ‘suspended sentence’ as their preferred sentencing option. Therefore, the materials are unlikely to be subject to floor or ceiling effects, and consequently, are likely to be sensitive to detecting group differences in the experimental design. In addition, the new attentional control check question performed better than the question it replaced from pilot study one. Thus, all three attentional control check questions presented in this pilot study were retained – as data quality controls - for the subsequent main study.

Experiment 1

6.16 Study Aims

Now that the fictional case materials have been tested and amended across two pilot studies, they can be used to investigate perceptions of a defendants' TBI in a sample of 'mock' legal decision makers. As previously discussed, it is important to evaluate how key legal decisions around sentencing are influenced by the perceived or expected trajectory of physical recovery after TBI, whereby accompanying physical problems to other, more hidden symptoms, may be acting as a visible marker for TBI disability. This Experiment aimed to examine the effect of physical marker of TBI disability, alongside the trajectory of recovery, on sentencing recommendations. Thus, it was hypothesised that: (1) the appropriateness of magistrates' sentencing recommendation would vary across four TBI presentations – further explained below (H1); (2) participants presented with TBI information, explaining that physical health issues were still ongoing for the defendant would rate the magistrates' sentencing decision as more harsh/less lenient than participants in the TBI condition whereby physical health issues were resolved prior to the offence (*TBI- physical-ongoing* vs *TBI-physical-resolved*; H2); (3) participants presented with TBI information where physical health issues were resolved prior to the offence would rate the magistrates' sentencing decision as more harsh/less lenient than participants presented with a description of a defendant with TBI but no accompanying physical health issues (*TBI-physical-resolved* vs *TBI-no-physical*; H3), and (4) participants presented with a description of a defendant with TBI but no accompanying health issues would rate the magistrates' sentencing decision as more harsh/less lenient than participants presented with information about the defendant without a history of TBI (*TBI no-physical* vs *no-TBI*; H4). The secondary aim of this study was to explore how factors - including perceived risk, knowledge and attitudes towards brain injury, and general legal opinions - may also contribute to sentencing related decisions.

6.17 Methods

6.17.1 Participants

The study was advertised as ‘Legal decision making in the Magistrates’ court.’ Participants were drawn from the general adult population (i.e.,18 and over) and thus represented a sample of ‘mock’ legal decision makers who were recruited from three sources: (1) Prolific (www.Prolific.co); (2) the Swansea University Department (now ‘School’) of Psychology Participant Pool, and (3) social media / University-based advertisements. Additional inclusion criteria were applied for participants recruited through Prolific. Specifically: (1) participants needed a minimum of 90% approval rating on Prolific; (2) needed to report that English was their first language, and (3) must have not taken part in any previous Prolific studies focused on this research theme (i.e., data collected for Chapters 3 and 4, and the two pilot studies presented above). Participants recruited through the platform Prolific received a payment of £2.50, and participants recruited Swansea University Department of Psychology participant pool received two course credits in exchange for participating. Participants recruited through other avenues (e.g., social media adverts) were eligible to enter a prize draw to win a £15 amazon voucher (1 voucher was provided for every 50 participants who entered the prize draw).

6.17.2 Pre-Registration

This study was pre-registered on the Open Science Framework (OSF) prior to commencing data collection (https://osf.io/xpy7a). The pre-registration included a detailed summary of: (1) data exclusions applied to ensure high quality data, and (2) power analysis, including the use of sequential analysis. For an account of how these methods were included in this experimental design, see Bryant (2020).

6.17.3 Data Exclusions

The following pre-registered exclusion criteria were applied prior to any data analysis. Participants were excluded if they:

1. Responded incorrectly to two or more attentional control checks about the fictional case scenario.
2. Rated their level of English Language proficiency (if English language was not selected as their first language) as very weak, weak or intermediate.
3. Completed the study in less than 6 minutes or more than 30 minutes (determined via research group's own timed completion of the study when completed at a fast, moderate, and slow pace).
4. Shared an IP address and demographic information (age, gender, ethnicity, employment status) with another participant (i.e., potential duplicate entry).
5. For part of the exploratory analyses, failing any of the attentional control checks embedded in the PBIM36 and BIAS20 resulted in exclusion.

6.17.4 Power Analysis

The researchers aimed to achieve 80% power for all three planned contrasts for a one-way between subjects ANOVA; to achieve 80% power for *all three* pairwise comparisons, it was necessary to specify power of .93 for each pairwise comparison (.93

x .93 x .93 = .80). Power analysis was conducted using the ANOVA_exact Shiny app (http://shiny.ieis.tue.nl/anova_exact/: Lakens & Caldwell, 2019), which can support factorial designs. The Shiny App requires estimated means and standard deviations for each condition as inputs. The inputs for power analysis used the pilot study two data (*M*= 3.50. *SD*=1.00) for the *no-TBI* condition, with means values estimated for the remaining three TBI Presentation conditions and with an estimated effect size of Cohen's *d* = .40 and a pooled SD of 1.00. Following the predicted pattern of findings outlined for the study's hypothesis, inputs of *M*= 3.90, *M*=4.30, *M*=4.70 were included for the *TBI-no-physical*, *TBI-physical-resolved* and *TBI-physical-ongoing* conditions respectively. As each pairwise comparison had a predicted direction of effect, one-tailed hypothesis tests were specified. A Bonferroni correction was then applied as three pairwise contrasts were planned, reducing the alpha level to .017 (.05/3). This analysis produced a required sample size of 163 per condition, resulting in a total sample size of 652. For a full step-by-step guide to these power analysis calculations, see the pre-registration document (https://osf.io/xpy7a).

6.17.5 Sequential Analysis

Sequential analysis was used, which allows for data 'peeking' at pre-specified interim checkpoints (Lakens, 2014). Stopping rules are also specified, such that data collection can be terminated early if the specified hypothesis tests are statistically significant or if the observed effect size is below a set threshold. Sequential analysis requires that *p*-values are adjusted using the *alpha spending function* (Lakens, 2014). Two interim data checkpoints were pre-registered: (1) at 50% of the full sample (326 complete datapoints) and (2) at 75% of the full sample (489 complete data points). Adjusted *p*-values were calculated using the GroupSeq package for R following the method detailed in the pre-registration (https://osf.io/qtufw/). The resultant adjusted *p* values were: Checkpoint 1 ($n = 326$): $p < .0085$; Checkpoint 2 ($n = 489$): $p < .0069$; Full sample (n = 652): $p < .0078$.

The same stopping rules were applied to each of the two interim 'peeking' points: (1) *All three* pairwise comparisons are statistically significant; or (2) The effect sizes for *all three* pairwise comparisons are smaller than Cohen's $d = .10$, in which case data collection would be terminated for futility.

6.17.6 Sample for Confirmatory Analysis and First Part of Exploratory Analysis

Following the steps outlined for the pre-registration, data collection was terminated at peeking point one as the stopping rules were met at this point, resulting in a total of 384 participants (before exclusions). Using the exclusion criteria outlined above for the confirmatory and first part of exploratory analysis, 41 participants were excluded for the following reasons: (1) attentional control check fails (n = 9): (2) English language proficiency ratings (n = 2), and (3) timing data (n = 29). For timing data, a deviation (and subsequent amendment) was made to the pre-registration. On reviewing the distribution of 'completion time' data, it became apparent that the initial cut-off of 30 minutes would potentially exclude participants who had fully engaged in the research, and no obvious breakpoint in timing data was observed until 41 minutes. As a result, the completion time threshold was increased to 41 minutes (the point at which distribution data indicated a natural breakpoint) for the purpose of data exclusions (Note: OSF record was updated accordingly); and (4) failed more than one of these listed (1 – 3) data exclusions (n= 1).

After exclusions, a final sample of 343 participants were included in the confirmatory analysis, exceeding the minimum sample size requirement of 326 participants for the first peeking point. Overall, participants' ages ranged from 18 to 74 years (*M* = 28.48, *SD* = 11.99) and 276 participants (80.5%) were female. For further demographic information, see Table 6.11.

Table 6.11

Summary of Demographic Characteristics

Demographic characteristics		**Sample (n= 343)**	
		n	**%**
Gender			
	Male	65	19.0%
	Female	276	80.5%
	Other gender identity	2	0.6%
Ethnicity			
	White	306	89.2%
	Multiple ethnic groups	15	4.4%
	Asian	13	3.2%
	Black	4	1.2%
	Latino/Hispanic	1	0.3%
	Middle Eastern	2	0.6%
	Other or prefer not to say	3	0.9%
Educational attainment			
	No formal education	1	0.3%
	Secondary School	33	9.6%
	Sixth form/ college	141	41.1%
	First degree	127	37.0%

Master’s degree	33	9.6%
PhD/ Doctorate	6	1.7%
Other	2	0.6%
Employment status		
Full time employment	75	21.9%
Part-time employment	66	19.2%
Retired	2	0.6%
Unpaid carer	19	5.5%
Not working due to disability/health reasons	6	1.7%
Actively seeking employment	15	4.4%
Volunteer	2	0.6%
Full time student	153	44.6%
Part-time student	5	1.5%
Country of residence		
Australia	2	0.6%
Canada	5	1.5%
Ireland	4	1.2%
Portugal	1	0.3%
Spain	1	0.3%
United Kingdom	317	92.4%
USA	13	3.8%

6.17.7 Design

This experiment followed a one-way, between subjects’ design. The independent variable (IV) was TBI Presentation which had four levels: (1) *TBI-physical-ongoing;* (2) *TBI-physical-resolved;* (3) *TBI-no-physical*, and (4) *no-TBI*. The central dependent variable (DV) was the ‘Appropriateness of Sentencing’ variable presented post-verdict. Additional dependent variables included Sentencing Options, Consideration of Factors, Perceptions of the Defendant's TBI, and Perceived Dangerousness. Additionally, four measures were included to explore levels of proximity (LOC), knowledge (PBIM36) of, and attitudes (BIAS20) towards, brain injury and one further measure evaluating legal opinions (Jury Bias Scale, Kassin and Wrightsman, 1983). The experimental conditions and measures are outlined in greater detail below.

6.17.8 Materials

6.17.8.1 Fictional Magistrates' Sentencing Remarks

The fictional magistrates' sentencing remarks (see section 6.7 'Development of Fictional Sentencing Case Materials') was used for this study, using the reduced sentencing verdict piloted in Pilot Study 2 (See Appendix R). In brief, the case described a 23-year-old male defendant who has been charged with Assault Occasioning Actual Bodily Harm against a 26-year-old male victim. This was followed by the presentation of the aggravating and mitigating factors in the case which were common across all four experimental conditions. Those assigned to the one of the TBI conditions were also presented with an additional mitigating factor, which was presented alongside the three common mitigating factors presented in the control (*no-TBI*) condition. The description of the defendants TBI was validated by one of the research team (AW), who has clinical and medico-legal expertise, as containing information about TBI which would be relevant in a criminal trial.

In the TBI experimental conditions, one of the following additional mitigating factors was presented:

TBI-physical-ongoing condition:

"You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. Since your injury, we are aware that you have been left with some mobility difficulties which require the daily use of a crutch, and on particularly bad days, a wheelchair. We recognise that your brain injury may have contributed to your actions on the day of the assault."

TBI-physical-resolved condition:

"You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. Although fully resolved before the assault, we are aware that you were initially left with some mobility difficulties which required the daily use of a crutch, and on particularly bad days, a wheelchair. We recognise that your brain injury may have contributed to your actions on the day of the assault."

TBI-no-physical condition:

"You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. We recognise that your brain injury may have contributed to your actions on the day of the assault."

After participants were presented with the aggravating and mitigating factors relevant to their allocated TBI Presentation condition, a description of the Sentencing Council Guidelines for the offence (aligned to the UK Sentencing Council Guidelines) was outlined. Lastly the magistrates' own sentencing verdict of a 13-week suspended custodial sentence, with a 12-month suspended period, was outlined (see Appendix R). Typically, in mock jury research designs, the jurors take the role of the key decision maker in research (e.g., Green & Cahill, 2012; Gurley & Marcus, 2008). However, in this instance the verdict was presented by the magistrate, after which participants were asked to rate the appropriateness of this decision. The scenario was developed in this way to simulate a realistic magistrates' deliberation process in the UK and to increase the ecological validity of the fictional case. Indeed, it seems reasonable to anticipate that the participants in this study would hold similar misconceptions about brain injury to those of a magistrate, given the parallels drawn between general population and non-expert professionals in research (O'Rourke et al., 2018a; Yuhasz, 2013). Thus, the key manipulation of the defendant's TBI presentation in this study could be isolated from the magistrates' deliberation process, focusing instead on participants perceptions of the defendant's TBI as a result of the case information, but framed in the context of a magistrates' court setting.

6.17.8.1. Appropriateness of Sentencing Ratings and Sentencing Options

The same ratings for Appropriateness of Sentencing and Sentencing Options (with supplementary question) variables as pilot study one and two were adopted (see section 6.9.4.1).

6.17.8.2 Consideration of Factors

Six consideration of factors questions (previously described, see section 6.9.4.1) measured how influential each of the individual aggravating and mitigating factors were in the participants sentencing recommendation (i.e., 1 = Not at all influential to 5 = Extremely influential) and were presented to all participants. To do this, the original aggravating and mitigating factors presented in the case materials were presented to participants as questions. In addition, one further TBI mitigating factor item (with wording differences to reflect the variation of TBI information presented) was presented to the *TBI-physical-ongoing*, *TBI-physical-resolved* and *TBI-no-physical conditions*. Again, the presentation order of these questions was randomised across participants. See example question below for the *TBI- no- physical* condition.

TBI-no-physical mitigating factor

> "The defendant acquired a brain injury 14 months ago in a work-related incident. Since then, the defendant now finds it difficult to read social situations, has developed a tendency to act impulsively and makes rash decisions. The defendant also struggles to manage and control his emotions. The defendant's brain injury

may have contributed to his actions on the day of the assault."

6.17.8.3 Perceptions of the Defendant's TBI

Participants in the three experimental TBI conditions (*TBI-physical-ongoing, TBI-physical-resolved* and *TBI-no-physical*) rated their agreement on a 7-point scale (1= Strongly Disagree to 7 = Strongly Agree) with five statements: (1) *The defendant has made a good recovery*; (2) *The defendant's brain injury has had a big impact on daily life*; (3) *The defendant sustained a severe brain injury;* (4) *The defendant is going to make a full recovery in the future*, and (5) *The defendant is still experiencing ongoing issues as a result of their brain injury*.

6.17.8.4 Perceived Dangerousness Questions

Participants rated their agreement (1 = Strongly Disagree to 7= Strongly Agree) with five statements designed to measure perceived risk and dangerousness of the defendant: (1) The defendant should be considered a danger to society; (2) The defendant has a criminal personality; (3) The defendant has a violent personality; (4) The defendant is likely to re-offend, and (5) The defendant's behaviour is unpredictable. Three of the five items were drawn from previous research (Sanderson et al., 2000). The five items were summed to provide a composite score (7-35) of risk and dangerousness, such that higher scores indicated greater perceived levels of risk and dangerousness. Cronbach's α indicated that the five items had 'excellent' internal consistency (α= .80).

6.17.8.5 Measures

Four additional survey measures were included in this study, namely the PBIM36, BIAS20, LOC, and the Jury Bias Scale (JBS; Kassin & Wrightsman, 1983). To measure knowledge and attitudes of brain injury, the newly developed PBIM36 and BIAS20 (see Chapter 5) were used, with higher scores on both these scales indicating higher levels of knowledge of, or more favourable attitudes towards, brain injury. The LOC (see Holmes et al., 1999) was also included as a measure of exposure and proximity to brain injury, with higher rankings indicating greater proximity to individuals with brain injury (see Chapter 3, section 3.9.3.4 for a full description of the LOC). The JBS is described below.

6.17.8.6 Jury Bias Scale (JBS)

The Jury Bias Scale (JBS; Kassin & Wrightsman, 1983) is a 22-item questionnaire evaluating individual differences in pre-trial opinions. The reason for including this measure was two-fold: (1) first to control for the effect of legal opinions on sentencing recommendations, as it is unlikely that a magistrates' sentencing recommendation would be impacted by legal opinions, and (2) to explore how legal opinions relate to sentencing recommendation in this population. Nine items are worded to reflect pro-prosecution bias (e.g., '*Extenuating circumstances should not be considered – if a person commits a crime, then that person should be punished'*) and eight are worded to reflect pro-defense bias (e.g., *'Too many innocent people are wrongly imprisoned'*). Five additional 'filler' items are included (e.g., '*Hypocrisy is on the increase in society')* to distract the respondent from the purpose of the scale but are not scored. All other items are scored on a 5-point Strongly Disagree (1) to Strongly Agree scale (5), and the eight pro-defense questions are reverse scored. Total scores are calculated by summing individual items scores. For this study, one item was removed due to lack of relevance to the UK court system (Item 8: '*The death penalty is cruel and inhumane*'). Consequently, scores could range from 16 to 80, with higher scores indicative of stronger pro-prosecution bias (see Appendix V).

6.17.9 Procedure

Ethical approval was granted by Swansea University, Department (now 'School') of Psychology Research Ethics Committee (reference: 1529; see Appendix W). The study was conducted through the online survey platform 'Qualtrics' and advertised as 'Legal decision making in the magistrates' court.' Participant information page and consent processes followed the same procedures previously described in pilot study one (see section 6.9.5 Procedure). Participants were recruited through: (1) Swansea University School of Psychology (now 'School') participant pool, and (2) social media/campus wide adverts. Participants were first asked to create a personal reference number and were informed that this would be required should they wish to subsequently withdraw their data from the study. All participants were then asked to complete standard demographic questions before proceeding to the magistrates' scenario which were presented across the following pages – each with embedded page timers: (1) Magistrates' summary overview; (2) Mitigating factors; (3) Aggravating factors, and (4) Sentencing Guidelines before the magistrates' own sentencing verdict of a suspended custodial sentence was delivered. Participants were randomly assigned to experimental conditions and to one of two presentation orders for the Mitigating and Aggravating factors (e.g., aggravating first, or mitigating first).

Following presentation of the magistrates' sentencing remarks, participants were asked to rate the appropriateness of the magistrates' sentencing verdict (post-verdict decision) and then to indicate their own preferred sentencing option (including length). Next, a set of questions (six for control condition, and seven for conditions where TBI information was presented) were presented that asked participants to rate how influential each of the aggravating and mitigating factors were in their sentencing decision. The presentation order of these questions was randomised. After this, a reminder of the magistrates' sentencing verdict was presented, and participants were then asked to re- rate the appropriateness of this verdict (post-rating decision) and indicate their preferred sentencing option. Participants were informed at this point that they could change their original decision should they wish but did not need to.

After sentencing recommendations had been made, an open-ended question was presented, which asked participants what information about the case helped them reach their decision. Participants in the three TBI experimental conditions then rated their agreement with five statements about their perceptions of the defendant's brain injury; these statements were presented in a random order. Next, the five Perceived Dangerousness questions were presented to all participants, also in a random order. The three attentional control check questions were then presented, in a fixed order. Finally, participants completed the PBIM36, BIAS20, LOC and JBS in a random order. The presentation order of items contained within the PBIM36, BIAS20, and JBS was randomised – but the order presentation was fixed for the LOC. Finally, participants were presented with a debrief page where the aim of the study was outlined further.

Participants were also signposted to the research team, their GP and Wellbeing services at Swansea University (as applicable) and were thanked for their time.

6.17.10 Statistical Analysis

To test the central hypothesis for this study, a one way between subjects' analysis of variance (ANOVA) was conducted with three planned pairwise contrasts. Adhering to the *alpha spending function* in sequential analysis, an adjusted p-value ($p < .0085$) was adopted to determine significance. Additionally, reported Cohen' *D* values uses the pooled standard deviation for groups involved in the contrast. Parametric tests were performed in this study and assumption checks were conducted prior to statistical analysis. Any violations to the following assumption tests are reported in the results section, and unless otherwise stated, were not violated. For assumption of normality checks, Skewness and Kurtosis scores were calculated across conditions scores, and values between -2 to + 2 were deemed to indicate normal distribution (George & Mallery, 2010). For confirmatory analysis, and following the pre-registration protocol, a violation of the assumption of normality would be followed with an ordinal regression analysis. For the remaining exploratory analysis, violations to the assumption to normality are reported. However, simulation research shows that ANOVA is robust against violations of normality (Schmider et al., 2010) and no further follow up tests were deemed necessary. To test the assumption of homogeneity Levene's test for equality of variance was used, and any violations ($p<.05$) to this assumption are reported with accompanying remedial actions.

For analysis of covariance (ANCOVA) tests, further checks were made. To test for the independence of the covariate, one-way between subject's ANOVAs were conducted with the covariate as the DV, and TBI presentation as the IV (p>.05). To test the assumption of homogeneity of regression slopes, the interaction between the covariate and the dependent variable was tested (p>.05). Furthermore, Pearson's correlations were conducted when more than one measure was included as a covariate, with values below r = 0.6 deemed acceptable.

In addition to this approach for assumption checks, p-values were Bonferroni corrected (.05/ number of conditions) to control for the family error rate (FWER) when a family of tests were required. Where applicable, adjusted alpha values to determine significance are reported in the results section.

6.18 Results

6.18.1 Phase One of Data Analysis: Confirmatory Analysis

Descriptive statistics for each condition for the central dependent 'Appropriateness of Sentencing' variable used in the confirmatory analysis are presented in Table 6.12.

Table 6.12

Descriptive Statistics for the 'Appropriateness of Sentencing' Central Dependent Variable (Post-Verdict)

TBI Presentation	***M***	***SD***	**n (343)**
TBI-physical-ongoing	3.88	0.81	82
TBI-physical-resolved	3.83	0.72	90
TBI-no-physical	3.90	0.73	87
No-TBI	3.92	0.76	84

With the exception of one condition, Skewness and Kurtosis values all fell within acceptable parameters. To test the central hypothesis that appropriateness of sentencing rating would vary as a function of TBI Presentation at the first decision timepoint (post- verdict), a one-way between subject ANOVA was conducted with three planned contrasts conducted for hypotheses testing. The omnibus test was not statistically significant, $F(3, 339) = 1.94$, $p = .900$, $\eta p^{2\,=}$ .002 indicating that there was no statistically significant effect of TBI Presentation on the ‘Appropriateness of Sentencing’ ratings. To test the central hypotheses, three planned contrasts were conducted (see Table 6.13). As can be seen in Table 6.13, the *p* values (one-tailed) for all contrasts were larger than the critical alpha value for peeking point one ($p<.0085$). Furthermore, the effect sizes were very close to zero. Consequently, the hypotheses for this study can be rejected. Following the statistical analysis plan, a follow up ordinal regression was conducted owing to a violation of the assumption of normality in one condition. No significant improvement in the fit of the null model was observed by including the predictor variable TBI Presentation (X^2 (3) =0.83, p=.842), thus providing confidence in the main confirmatory analysis.

Table 6.13

p-values and Cohen's d *Values for Planned Contrasts*

Pairwise contrast	***p*-value (one-tailed)**	**Cohen's *d* (95% CI)**
TBI-physical-ongoing vs TBI-physical-resolved	.350	0.06 (-.24, .36)
TBI-physical-resolved vs TBI-no-physical	.289	0.09 (-.38, .21)
TBI-no-physical vs no-TBI	.431	0.03 (-.33, .27)

6.18.2 Phase Two of Data Analysis: Exploratory Analysis (Part One)

As per the pre-registration, exploratory analysis was conducted across two parts. The first part focused on exploring the following measures: consideration of mitigating and aggravating factors, participants' sentencing recommendations (post-rating), sentencing options, perceptions of the defendant's brain injury, and perceived risk and dangerousness of the defendant.

6.18.3 Consideration of Factors

Descriptive statistics for participants' ratings of the influence of the aggravating and mitigating factors are presented in Table 6.14. A series of one-way ANOVAs (adjusted $p<.07$, .05/7) were also conducted to evaluate the effect of TBI Presentation condition on these ratings. TBI Presentation condition did not significantly affect the ratings for any of the aggravating or mitigating factors.

Table 6.14

Descriptive Statistics and ANOVA Tests for each Aggravating and Mitigating Factor Revealing How Influential these were in Sentencing Ratings across TBI Presentation Conditions

	TBI-physical-ongoing (n = 82)	TBI-physical-resolved (n = 90)	TBI-no-physical (n= 87)	No-TBI (n = 84)	One-way ANOVA		
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*F* (3, 339)	*p*-value	ηp^2
Aggravating Factors							
Punched victim 3 times	3.74 (0.94)	3.88 (1.02)	3.64 (1.00)	3.94 (0.97)	1.58	.194	.014
Unprovoked attack	3.59 (0.96)	3.54 (1.03)	3.52 (0.96)	3.76 (1.04)	1.04	.376	.009
Caused significant harm	3.95 (0.82)	4.00 (0.89)	3.99 (0.84)	4.01 (0.74)	0.09	.968	.001
Mitigating Factors							
First offence	3.57 (1.11)	3.28 (0.98)	3.53 (1.02)	3.58 (1.01)	1.72	.163	.015
Culpability low for offence	3.40 (1.06)	3.09 (1.04)	3.02 (1.00)	3.20 (1.00)	2.21	.086	.019
Pleaded guilty	3.72 (0.95)	3.34 (1.04)	3.40 (1.02)	3.51 (1.14)	2.15	.094	.019
TBI mitigating factor[abc]	3.85[a] (1.08)	3.57[b] (1.08)	3.85[c] (1.02)	-	2.13[de]	.121	.016

[abc]an additional TBI mitigating factor question was presented to participants in [a]TBI-physical-ongoing (n=82) [b]TBI-physical-resolved (n=90), and [c]TBI-no-physical (n=87) asking participants to rate how influential the TBI mitigating factor was in their sentencing decision, [d]responses to each of the individual TBI mitigating factor questions (presented to TBI Physical-Ongoing, TBI Physical-Resolved, and TBI-no-physical) were collapsed into one variable 'TBI Mitigating Factor' for the purposes of data analysis. [e]adjusted degrees of freedom for this ANOVA test are *F*(2, 256) due to exclusion of no-TBI condition from the question.

6.18.4 Appropriateness of Sentencing (Post-Rating)

To test the effect of TBI Presentation on 'Appropriateness of Sentencing' ratings at decision timepoint 2, a one-way between subject ANOVA was conducted. Means and SD for the 'Appropriateness of Sentencing' variable (post-rating) are presented in Table 6.15.

Table 6.15

Descriptive Statistics for the 'Appropriateness of Sentencing' Variable - Post-Rating

TBI Condition	***M***	***SD***	**n (343)**
TBI-physical-ongoing	3.85	0.77	82
TBI-physical-resolved	3.72	0.90	90
TBI-no-physical	3.78	0.75	87
No-TBI	3.77	0.81	84

Consistent with the post-verdict decision, appropriateness of sentencing recommendations did not statistically differ across TBI Presentation conditions after consideration of the aggravating and mitigating factors, F (3, 339) = 0.38, p = .769, $\eta p^{2=}$ .003. To explore whether there was a difference in appropriateness of sentencing rating before and after the participants had rated each of the aggravating and mitigating factors, a two-way mixed ANOVA was conducted. First, the main effect of TBI Presentation (between subjects' independent variable with four levels: *TBI-physical-ongoing, TBI- physical-resolved*, *TBI-no-physical* and *no-TBI)* was not significant, F(3, 339) = 0.24, p= .871, $\eta p^{2\,=}$ .002. However, there was a significant main effect of decision timepoint (within subjects' independent variable with two levels: *post-verdict* and *post-rating*) on the 'Appropriateness of Sentencing' dependent variable, $F(1, 339) = 10.03$, $p = .002$, $\eta p^{2} =$ .03. Estimated marginal means (EMM) for appropriateness of sentencing ratings were significantly lower post-rating (*EMM* = 3.88, *SE* = .04) than post-verdict (*EMM* = 3.78, *SE* = .04). This indicates that participants considered the sentencing decision to be significantly more lenient after they had individually considered each aggravating and mitigating factors in the case and reminded of the magistrates' own sentencing verdict. The interaction between TBI Presentation and decision timepoint (post-verdict and post rating) was not statistically significant, $F(3, 339) = 0.66$, $p = .578$, $\eta p^{2} =$ .01. In sum, TBI Presentation did not have a significant effect on appropriateness ratings after viewing the magistrates' verdict and after evaluating each of the aggravating and mitigating factors.

6.18.5 Sentencing Options – Post-Verdict and Post-Rating

The proportion of participants who recommended each of the four sentencing categories was examined (see Table 6.16). Namely, whether the sentencing option selected changed post-verdict to post-rating, and whether the sentencing option selected changed as a function of TBI Presentation condition. Most participants selected 'Suspended Sentence' post-verdict (n = 203, 59.2%) and post-rating (n = 209, 60.9%), Less than 1% of participants selected 'Referral to the Crown Court' post-verdict (n = 3, 0.9%) and post-rating (n = 1, 0.3%). Most participants (n = 298, 86.9%) selected the same sentence post-verdict and post-rating. For those who did change their sentencing verdicts from post-verdict to post-rating, a similar proportion moved to a harsher sentence (n = 23, 6.7%) as selected a more lenient sentence (n = 22, 6.4%).

Table 6.16

Descriptive Statistics for Sentencing Option – Post-Verdict and Post-Rating

Sentencing Option	**Sentencing option – post verdict**				**Sentencing option – post rating**			
	TBI-physical ongoing (n= 82)	*TBI-physical resolved* (n= 90)	*TBI-no-physical* (n = 87)	*No-TBI* (n= 84)	*TBI-physical ongoing* (n= 82)	*TBI-physical resolved* (n= 90)	*TBI-no-physical* (n = 87)	*No-TBI* (n= 84)
Community order n (%)	18 (22.0%)	22 (22.4%)	24 (27.6%)	27 (32.1%)	14 (17.1%)	22 (22.4%)	23 (26.4%)	26 (31.0%)
Suspended Sentence n (%)	53 (64.6%)	55 (61.1%)	50 (57.5%)	45 (53.6%)	57 (69.5%)	55 (61.1%)	52 (59.8%)	45 (53.6%)
Custodial Sentence n (%)	9 (11.0%)	13 (14.4%)	12 (13.8)	12 (14.3%)	11 (13.4%)	13 (14.4%)	11 (12.6%)	13 (15.5%)
Crown Court n (%)	2 (2.4%)	0 (0.0%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.1%)	0 (0.0%)

To investigate whether a shift in sentencing recommendation was associated with TBI Presentation condition, a 3 (Shift in sentence: harsher, no change, more lenient) x 4 (TBI Presentation: *TBI-physical-ongoing, TBI-physical-resolved*, *TBI-no- physical*, *no-TBI)* chi-square test of independence was conducted. No significant association between TBI Presentation and shift in sentence from post-verdict to post- rating was found, X^2 (6) = 5.26, *p* = .512.

6.18.6 Perceptions of the Defendant's TBI

Participants in the three TBI experimental (*TBI-physical-ongoing*, *TBI-physical-resolved*, and *TBI-no-physical*) conditions rated their agreement to five statements pertaining to the defendant's brain injury. A series of one-way between subjects' ANOVAs (adjusted $p<.01$, 0.05/5) were conducted to evaluate whether perceptions of the defendant's TBI differed across conditions (see Table 6.17). Significant differences were observed across items 1, 2 and 4 (see Table 6.17).

Table 6.17

Participants Perceptions of the Defendant's TBI across the Three TBI Experimental Conditions

Perceptions of the defendant's TBI	**TBI-physical-ongoing (n= 82)**	**TBI-physical-resolved (n= 90)**	**TBI-no-physical (n= 87)**	**One Way ANOVA**		
	M (SD)	*M (SD)*	*M (SD)*	$F(2, 256)$	p-value	ηp^2
1. The defendant has made a good recovery	3.71 (1.18)	4.33 (1.17)	3.89 (1.07)	6.95	.001	.05
2. The defendant's brain injury has had a big impact on their daily life	5.88 (1.05)	5.48 (1.21)	5.36 (1.16)	4.78	.009	.04
3. The defendant has sustained a severe brain injury	5.67 (1.15)	5.27 (1.36)	5.41 (1.36)	2.12	.123	.02
4. The defendant is going to make a full recovery in the future	3.82 (1.08)	4.37 (1.25)	4.22 (1.06)	5.32	.005	.04
5. The defendant is still experiencing ongoing issue as a result of their brain injury	5.79 (1.03)	5.40 (1.15)	5.68 (0.97)	3.20	.043	.02

Bonferroni corrected post hoc comparisons showed that the *TBI-physical-resolved* condition had significantly higher mean values (p<.05) than the *TBI-physical-ongoing* and *TBI-no-physical* conditions for item 1 - '*The defendant has made a good recovery'*. In contrast, no significant difference (p>.05) was found between the *TBI-physical- ongoing* and *TBI-no-physical condition.* For item 2 ('*The defendant's brain injury has had a big impact on their daily life*'), comparisons revealed significantly higher agreement ratings for the *TBI-physical ongoing* than the *TBI-no-physical* condition (p>.05). No other post-hoc comparisons were significant for this item (p>.05). For item 4 ('*the defendant is going to make a full recovery in the future'*), post hoc comparisons revealed that the *TBI-physical-resolved* condition had statistically significant higher agreement ratings than the *TBI-physical-ongoing* condition (p<.05). No other pairwise comparisons were significant for this item (p>.05). Overall, these findings show that participants perceived the defendant with resolved physical health issues as having made a better recovery overall and believed they would go on to achieve a better recovery in the future compared to a defendant with ongoing physical health issues. Equally, participants perceived the impact of the defendant's TBI as more severe when they had ongoing physical issues (physical marker of injury and disability) than without any physical issues.

6.18.7 Perceptions of the Defendant – Perceived Dangerousness

Next, exploratory analysis was conducted to evaluate how participants evaluated perceived levels of dangerousness as a function of TBI Presentation. Descriptive statistics are presented in Table 6.18.

Table 6.18

Means and Standard Deviations for Perceived Dangerousness Items across TBI Presentation Conditions

	TBI presentation			
Perceived dangerousness	**TBI-physical-ongoing (n= 82)**	**TBI-physical-resolved (n= 90)**	**TBI-no-physical (n= 87)**	**No-TBI (n = 84)**
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
Total score	18.66 (4.90)	17.79 (5.06)	18.26 (4.32)	17.50 (5.54)
The defendant should be considered a danger to society	3.43 (1.34)	3.18 (1.44)	3.37 (1.27)	3.10 (1.38)
The defendant has a criminal personality	2.71 (1.40)	2.54 (1.18)	2.64 (1.35)	2.82 (1.21)
The defendant has a violent personality	3.66 (1.43)	3.40 (1.44)	3.39 (1.40)	3.83 (1.33)
The defendant is likely to re-offend	3.96 (1.13)	3.71 (1.30)	3.76 (1.19)	3.43 (1.37)
The defendant's behaviour is unpredictable	4.90 (1.22)	4.96 (1.44)	5.10 (1.13)	4.32 (1.41).

To test whether TBI Presentation impacted perceived dangerousness scores, a one- way between subjects ANOVA was conducted. No significant main effect of TBI Presentation on Perceived Dangerousness scores was found, F (3, 339) = 0.89, p = .448, ηp^2= .01. Thus, TBI Presentation did not affect perceptions of the defendant's dangerousness.

6.18.8 Exploratory Analysis (Part Two)

The aim of this second part of the exploratory analysis was to evaluate if factors such as familiarity, general legal opinions, and knowledge of, and attitudes towards brain injury, were contributing to the study's main findings. Prior to conducting any analyses of the four additional measures (LOC, JBS, PBIM36 and BIAS20) used in this study, one further exclusion criterion was applied. As detailed in the pre-registration document, participants were excluded if they made any errors on the five attentional control checks (e.g., click option disagree) embedded across the PBIM36 (three checks) and BIAS20 (two checks). Twenty participants were removed for this reason, resulting in a subset of 323 participants for these analyses (n = 77 for *TBI-physical-ongoing*, n = 81 for *TBI- physical-resolved*, n = 84 for *TBI-no-physical* and n = 81 for *No-TBI*). See Appendix X for demographic information for this subset of participants.

6.18.8.1 LOC and TBI Presentation

First, it was important to rule out the possibility that there were differences in level of proximity to brain injury across conditions. Participant's level of proximity to brain injury was measured using an adapted version of the LOC, which was ranked from low proximity (rank 1) to high proximity (rank 12; see Holmes et al., 1999). The modal rank was rank 4 ('*I have watched a documentary on the television and internet about brain injury'*) across all TBI Presentation conditions.

When participants were grouped into categories of 'low' (ranks 1 – 4), 'medium' (ranks 5 – 8) or 'high' (ranks 9-12) proximity, most participants fell in the 'low' category (see Table 6.19). As expected, a chi-squared test of independence confirmed no significant association between TBI Presentation and LOC Categories, X^2 (6) = 3.22, p =.781.

Table 6.19

Percentage of Participants in the LOC Categories for the TBI Presentation Conditions

LOC Category	TBI-physical-ongoing n (%)	TBI-physical-resolved n (%)	TBI-no-physical n (%)	No-TBI n (%)
Low[a]	43 (55.8 %)	45 (55.6%)	48 (57.1%)	49 (60.5%)
Medium[b]	14 (18.2 %)	11 (13.6%)	10 (11.9%)	14 (17.3%)
High[c]	20 (26.0%)	25 (30.9%)	26 (31.0%)	18 (22.2%)

Note: [a]Low LOC category = ranks 1-4, [b]Medium LOC category = ranks 5- 8, [c]High LOC category = ranks 9-12.

6.18.8.2 Knowledge, Attitudes and Legal Opinions: Association with Appropriateness of Sentencing Post-Verdict Ratings

The aim of this series of analyses was to examine knowledge of (PBIM36), and attitudes towards (BIAS20) TBI, in addition to pro-prosecution attitudes (JBS), as potential covariates. Descriptive statistics are presented for each measure in Table 6.20.

Table 6.20

Means and SD for PBIM36, BIAS20 and JBS scores for the TBI Presentation Conditions

Measure	TBI-physical-ongoing (n= 77) *M (SD*	TBI-physical-resolved (n = 81) *M (SD*	TBI-no-physical (n = 84) *M (SD)*	No-TBI (n = 81) *M (SD*
JBS	47.84 (6.60)	46.21 (5.69)	46.19 (6.27)	46.78 (5.61)
PBIM36	170.29 (17.42)	165.84 (16.88)	167.04 (16.87)	168.57 (17.95)
BIAS20	99.79 (12.18)	100.19 (11.13)	100.08 (10.59)	98.57 (11.64)

First, an analysis of covariance (ANCOVA) was conducted to determine the effect of TBI Presentation condition on the appropriateness of sentencing recommendation post-verdict whilst controlling for knowledge of brain injury, measured using the PBIM36. No significant effect of TBI Presentation was shown, $F(3, 318) = 0.50$, $p = .680$, $\eta p2 = .01$. However, the covariate – PBIM36, was significantly related to appropriateness of sentencing ratings - such that lower levels of knowledge were related to harsher ratings, $F(1, 318) = 5.23$, $p = .023$, $\eta p2 = .02$. Second, an ANCOVA was performed to determine the effect of TBI Presentation condition on the appropriateness of sentencing variable, whilst controlling for attitudes (BIAS20) towards brain injury.

No significant effect of TBI Presentation was shown, $F(3, 318) = 0.40$, $p = .753$, $\eta p2 = .004$, and the covariate, BIAS20, was not significantly related to appropriateness of sentencing ratings, $F(1, 318) = 0.79$, $p = .376$, $\eta p2 = .002$. Third, an ANCOVA was performed to determine the effect of TBI Presentation on the appropriateness of sentencing variable, whilst controlling for legal opinions, measured using the JBS. No significant effect of TBI Presentation was found, $F(3, 318) = 0.42$, $p = .739$, $\eta p2 = .004$. The covariate, JBS, was also not significantly related to appropriateness of sentencing recommendations post-verdict, $F(1, 318) = 1.39$, $p = .240$, $\eta p2 = .004$. Therefore, a physical marker of TBI disability did not alter sentencing recommendations, replicating the study's confirmatory findings, when knowledge of, and attitudes towards, brain injury were separately included as covariates. The same pattern was shown when a measure of legal opinions was included as a covariate.

6.18.8.3 *JBS, PBIM and BIAS, TBI Presentation and Appropriateness of Sentencing*

A further ANCOVA was conducted to examine the effect of TBI Presentation on appropriateness of sentencing ratings, when all three measures were included as covariates. Replicating all prior results, no significant effect of TBI Presentation was shown, $F(3, 316) = 0.6$ $p = .579$, ηp2= .01. Neither JBS, $F(1, 316) = 2.24$, $p = .135$, ηp2= .01, or BIAS20, $F(1, 316) = 1.11$ $p = .292$, ηp2= .004, scores were significantly related to appropriateness of sentencing ratings. However, and replicating the first ANCOVA, PBIM36 total score was significantly related to appropriateness of sentencing ratings, $F(1, 316) = 7.66$, $p = .006$, ηp2= .02, such that lower knowledge levels were related to harsher ratings. Thus, a physical marker of TBI disability did not alter appropriateness of sentencing ratings when legal opinions as well as knowledge of, and attitudes towards, brain injury were included as covariates in a combined model.

6.19 Discussion

TBI is often considered an invisible disability (McClure, 2011) and lay people typically expect recovery from TBI to follow the same trajectory as physical recovery (see Chapter 5). The focal hypothesis aimed to examine whether a physical marker of TBI affected the way 'mock' legal decision makers evaluated a defendant with TBI. To answer this question, TBI presentation was varied across three experimental conditions, but with the invisible effects of TBI (cognitive, emotional, and behavioural) held constant across all. Additionally, the defendant's physical difficulties were described as ongoing in one condition but resolved in a second - providing an indication of the trajectory of the defendant's physical recovery to the participant. In the third experimental condition, only the 'invisible' effects of TBI (cognitive, emotional, and behavioural) were described; physical recovery and related symptoms were never mentioned. All three of these conditions were compared to a control condition, in which there was no mention of TBI. Contrary to expectations, there were no significant differences between any of the four experimental conditions in evaluations of the magistrates' sentencing decision.

The absence of anticipated differences between groups cannot be explained by low statistical power - robust and comprehensive power analyses were performed to ensure that there was a high probability of detecting modest differences (see Lakens and Caldwell, 2019). Furthermore, the effect sizes for the planned comparisons were all very small ($d < 0.10$). Instead, exploratory analyses revealed that most participants opted for a suspended sentence, aligning with the sentencing decision outlined by the magistrate. Therefore, this raises the possibility that an anchoring effect may underpin the lack of difference observed across the conditions.

For the appropriateness of sentencing variable, participant's responses appeared to cluster around the midpoint of the scale post-verdict, indicating that participants were in general agreement with the magistrates' sentencing decision. However, there was also a shift to perceiving the magistrate's sentence as being somewhat more lenient at the second decision timepoint (post-rating), after systematic consideration of the aggravating and mitigating factors. Nevertheless, the process of anchoring can happen if the decision is influenced by the presence of a previously presented anchor value (see Bystranowski et al., 2021) and can lead to an under-adjustment in the decision (Epley & Gilovich, 2005). This under-adjustment can occur because other salient information in the case is weakened by the presence of the anchor (see Bystranowski et al., 2021). Thus, and in the context of the current study, the magistrates' own sentencing decision may therefore have constituted an anchor point to participants, as most scores coalesced around the mid-point of the scale indicating agreement with the sentencing recommendation. Indeed, when participants recommended their own sentence, the majority aligned to the magistrates' own sentencing verdict of a suspended prison sentence. This may have decreased this study's ability to detect key differences between groups, whereby other salient evidence in the study (i.e., experimental TBI conditions) was possibly weakened, potentially leading to an under adjustment in sentencing recommendations.

Further support for this 'anchoring' hypothesis comes from the lack of association between legal opinions (measured by the JBS) and participants' evaluations of the sentencing decision. Previous research has shown that the JBS is a good predictor of legal decisions, particularly when evidence is ambiguous (de la Fuente et al., 2003). Given the presence of the magistrates' sentencing verdict as a possible anchor point in the study, the ambiguity of the materials was possibly lessened by the magistrates' verdict. Thus, JBS scores were less likely to be related to the sentencing decision made by the participant after the anchor point. That said, there is also some indication that the fictional case materials developed here can lead to decision adjustments. In the first pilot study, participants adjusted their decision away from the magistrates' verdict point which was a custodial sentence at that point, and the majority of participants also opted for a suspended sentence. In the second pilot however, participants agreed with the lowered sentencing option of a suspended sentence. Therefore, and even though the sample sizes were small in both pilot studies, those results provide some evidence to indicate that anchoring may not be the only explanation of main findings.

The invisible nature of TBI (McClure et al., 2006), and lack of understanding of the consequences of TBI amongst non-expert populations (Swift & Wilson, 2001), may also have contributed to the lack of observed differences between groups. As indicated by LOC scores, most participants in this study indicated that they were unfamiliar with brain injury. Furthermore, and somewhat surprisingly, whilst PBIM scores were related to appropriateness of sentencing ratings, a higher level of knowledge of brain injury was associated with viewing the magistrate's sentence to be too lenient. Thus, it seems in this context, higher levels of knowledge were related to imposing a harsher judgement. However, until a new decision timepoint is included prior to the magistrate's sentencing verdict to offset the risk of an anchoring effect occurring, caution is needed when interpreting these findings.

The salience of the information provided to participants may have additionally contributed to the null effects observed. McClure et al. (2011) presented *images* of an adolescent with and without a visual marker of head injury, finding that participants were more likely to misattribute ambiguous behaviours (e.g., sleeps a lot, poor impulse control) to other causes in the absence of a visible marker of injury. In contrast, participants in the present study only read information pertaining to the TBI and its ongoing/resolved physical sequalae. However, participants perceptions of the defendant's recovery varied across conditions, and for the most part, in the expected direction. These differences, though statistically significant, were small and perhaps too small to impact how the magistrates' decision was evaluated. Therefore, whilst they highlight that the presence or absence of a physical marker of injury impacted some of the participants perceptions of the defendant's brain injury, these differences were insufficient in subsequently impacting the sentencing decision given the null effect observed. Thus, it is important to consider other ways to increase the salience of TBI in the future so the 'hidden' consequences are visible to participants, which may in turn, then impact on sentencing decisions and recommendations.

Contextual information may help to achieve this, because it can counteract the often-invisible nature of TBI (McClure & Abbott, 2009). Indeed, those with TBI can be at a clear disadvantage socially (McClure, 2001; Swift & Wilson, 2001). Consequently, this can mean that their ongoing challenges are frequently trivialised (Swift & Wilson, 2001). Therefore, it is possible that presenting educational materials may be one way to improve understanding of the challenges faced by individuals with TBI (McClure, 2011). Indeed, providing such educational materials may not only improve understanding of the challenges faced by those with TBI, but may also support key decision makers to be able to appropriately factor TBI disability into sentencing recommendations. Thus, improving understanding of the challenges that those with TBI- disability face should be a central focus to key decision-makers within the CJS.

6.19.1 Limitations and Future Research

As already discussed above, interpretation of the study outcomes was hindered by two main limitations. To investigate the potential presence of an anchoring effect, a new decision timepoint presented before the magistrates' own sentencing verdict is needed. This new decision timepoint is needed so that participants can respond to the case materials before any potential biasing information is provided. However, lack of contextual information about TBI in the study may have equally contributed to the null effect. Thus, whilst this study was designed to make TBI more visible to participants through the presence of a physical signal of TBI disability, this did not lead to an adjustment to the sentencing decision and additional information such as educational materials may be required. These materials may then better enable participants to take account of the TBI-related information presented to them about the defendant. Therefore, in addition to a novel decision timepoint to address the first limitation, providing additional contextual information (e.g., educational information) about TBI may increase the visibility of TBI disability. Consequently, this increased visibility may allow participants to take full account of TBI related information when reaching their sentencing decision.

One further potential limitation of this experiment is that some caution is needed in how the findings from the ANCOVA analyses are interpreted within such analyses. Typically, covariates – and particularly measures which may be affected by the experimental manipulations (i.e., the independent variable) - should be measured at baseline and before any experimental manipulation takes place. Therefore, completion of measures should take place before experimental manipulation (i.e., the inclusion of the independent variable) and ideally prior to participation in the experiment (i.e., by a number of days/weeks before the independent variable is introduced, depending on design). However, the feasibility of doing this in this study was limited by sample size requirements, the experimental design, and practical reasons (e.g., resources). Here for instance, the inclusion of the measures (JBS, BIAS20 and PBIM36) after the critical experimental manipulation (i.e., independent variable) and measurement of the dependent variable was necessary. Consequently, and as information about TBI was naturally captured within the TBI presentation conditions – albeit relatively brief in nature - there is some risk that this material subsequently affected responses to the items within the PBIM36 and BIAS20. In contrast, it is less of an issue for the JBS, as the independent variable was focused on manipulating information about TBI rather than legal opinions. Even so, the overall results of the ANCOVA analyses should be interpreted with caution and with the above caveat in mind.

6.19.2 Conclusions

The aim of this study was to explore how the presence or absence of a physical signal of TBI impacted participants' perceptions of a Magistrate's sentencing decision. Contrary to expectations, participants rated the appropriateness of the magistrates' sentencing decision similarly irrespective of the TBI information presented to them. However, whilst there was some indication that TBI presentation impacted how participants perceived the impact of the defendant's brain injury on his daily life, as well as current and future recovery, this did not affect how participants subsequently evaluated the magistrates' sentencing decision. One explanation for these findings includes the magistrates' sentencing verdict acting as an anchor point for participants, and thereby influencing participants sentencing judgements. Alternatively, insufficient contextual information (i.e., educational materials) about TBI may have been provided, meaning that participants were unable to take full account of the defendant's history of TBI. To address these possibilities and study limitations, a second experiment (see Chapter 7), will explore the effect of TBI presentation on an earlier decision timepoint to reduce the risk of an anchoring effect. Furthermore, education materials about TBI will be presented as contextual information about TBI is pivotal to ensure increased visibility of the defendant's TBI disability to decision-makers.

Chapter 6: Key Messages

- This study aimed to explore how perceptions of a defendant's brain injury, including the presence or absence of a physical TBI injury marker, influenced 'mock' legal decision makers responses to a fictional magistrates' sentencing verdict.
- Participants rated the magistrates' sentencing verdict similarly across all TBI presentation conditions, irrespective of whether a physical marker of TBI injury was present.
- An anchoring effect, alongside a lack of contextual information about the TBI, may have contributed to study findings. Thus, future research should consider these factors.

Chapter 7 Experiment 2

Traumatic Brain Injury (TBI) as a Mitigating Factor in the Magistrates' Court: The Effect of Education and Contextual Information on Sentencing Recommendations

7.1 Chapter Overview

Chapter 6 described an experiment which tested the hypothesis that a physical marker of injury would increase the visibility of TBI-related disability, leading participants to perceive a magistrates' sentencing decision to be more harsh. However, whilst varied TBI presentation led to differences in perceptions of the defendant's brain injury, these differences were small and did not affect how participants subsequently evaluated the magistrates' sentencing decisions. Two potential explanations were proposed in Chapter 6. First, whilst the magistrates' sentencing recommendation was initially included in the case materials to increase the ecological validity of the experiment, its inclusion prior to the participants' first decision timepoint may have prejudiced (i.e., via an anchoring effect) their evaluations of the case materials. Second, there may have been insufficient contextual information (i.e., educational materials) about TBI in the experiment, likely impacting participants' ability to take full account of the defendant's TBI. Thus, the aim of this study was to: (1) investigate participants' responses to the same fictional case materials but with a new decision included at an earlier timepoint, *prior* to the presentation of the magistrates' sentencing verdict; and (2) investigate the impact of including additional contextual information (i.e., educational materials) about TBI.

7.2 Education and Awareness of TBI Disability

As previously discussed, understanding of TBI amongst the public and non-expert professionals is generally poor (see Chapters 2 to 5). Furthermore, media portrayals of TBI are often unrealistic and misleading (Baxendale, 2004; Block et al., 2016), and a lack of recognition of TBI disability resulting from misconceptions and misattributions (i.e., wrongly attributing behaviour to other causes) can lead to negative experiences for survivors and their families (Block et al., 2016; McClure, 2011). Indeed, the effects of misconceptions and misattributions are important to consider because the negative consequences of these are far-reaching for the individual (Swift & Wilson, 2001). For instance, misattributions and misconceptions affect how a person with TBI is viewed by others, which given its invisible nature, has implications for important social contexts such as legal, education and employment (Block et al., 2016; McClure, 2011). Thus, countering the consequences of misconceptions for survivors by increasing knowledge and understanding of TBI is crucial, whereby better societal understanding of the long- term effects of brain injury may help to prevent a person with TBI being disadvantaged - such as the effects of TBI either going unnoticed or ignored by others.

However, whilst education is important, public awareness campaigns to date have either been very narrow in focus (e.g., sports concussion) and/or have failed to educate the public on the broader impacts of TBI (e.g., Glang et al., 2015; see Schellinger et al., 2018). In the USA for example, the Centre for Disease Control and Prevention's National Center for Injury Prevention and Control (CDC) launched their long-running Heads-Up campaign in 2003, which aimed to prevent concussion in children and young people by providing educational materials and videos to sports people, coaches, and parents (see Rice, 2018). To examine the effectiveness of this educational intervention, Rice (2018) compared parents' (n=140) pre- and post-intervention knowledge following presentation of either a video or an educational factsheet about concussion. Significant but modest increases in levels of concussion knowledge were found, suggesting that educational information about concussion can lead to improved knowledge and awareness of TBI in parents. However, interpretation of these findings is somewhat limited as Rice (2018) did not include a comparison, no- education group in the study design. Whilst limited in number, the impact of broader TBI public awareness campaigns have also been similarly explored. For example, Schellinger et al. (2018) explored the effectiveness of a brief educational video intervention in a general population sample of 392 participants recruited at a fair. The video contained a mixture of factual information about TBI and personal stories, whereby two experts and four individuals with brain injury provided information to challenge the most common misconceptions of TBI (e.g., hidden consequences, prevalence, definitions). Using 20 items modified from the CM-TBI questionnaire (Gouvier et al., 1988; Springer et al., 1997), Schellinger et al. (2018) found that including educational information about TBI improved knowledge levels compared to when no educational information was presented. Although, whilst such research provides additional support for the direct role of education in increasing knowledge and understanding of TBI amongst laypersons, educational campaigns which serve to increase understanding around the long-term effects of TBI, along with expectations around recovery, are still sorely needed (O'Brien et al., 2019).

7.3 Education about TBI Disability in the Criminal Justice System

Education, training, and awareness campaigns are also needed in specialist populations, including contexts where TBI is overrepresented, such as in the criminal justice system (see Chapter 1). Whilst research exploring the effect of education within the criminal justice system is very limited, one study has examined whether educational materials about TBI alter how participants evaluate a defendant with TBI (St Pierre & Parente, 2018). St Pierre and Parente (2018) randomised participants to either an educational intervention where they read a brochure about the consequences of brain injury, or to a control condition, where a brochure about jury duty was provided. After this, a fictional case was presented where a defendant, either described with severe, mild or no TBI, was accused of voluntary manslaughter. Findings showed that mortality ratings did not differ between TBI conditions and moreover, the educational brochure did not significantly affect morality ratings. However, guilt (at fault, liable, guilty) and punishment ratings were lower for the defendant with severe TBI compared to the mild or no TBI. Furthermore, participants who read the TBI brochure evaluated the defendant as being less guilty/culpable and were less likely to consider prison an appropriate form of punishment. These initial findings indicate that educational information about TBI helped decision-makers to understand the complex and ongoing impacts of TBI disability and take account of the TBI history when considering the defendant's culpability. However, there were a number of issues with the study design that may have confounded the results of the study. For instance, all participants were informed that the study was investigating perceptions of defendants with TBI (see St Pierre & Parente, 2018) despite the inclusion of a control condition where no TBI information was. presented. Additionally, whilst participants were asked to read the brochures for 10 minutes, no manipulation checks were included to ensure participants had attended to the information contained within. Furthermore, no measures were included to capture existing legal opinions and familiarity with, and proximity to, brain injury. Likewise, knowledge of, and attitudes towards, TBI, which may also be important contributory factors impacting sentencing decisions were not explored. Indeed, in Chapter 6, knowledge of TBI was associated with perceived appropriateness of sentencing recommendations. Thus, there is need to further investigate the role of educational information about TBI on sentencing recommendations within more rigorously controlled and well-designed studies.

In sum, existing research shows that educational information about TBI may contribute to improved levels of knowledge (e.g., Rice, 2018), and there is preliminary evidence to suggest that education about TBI may affect perceptions of defendants in criminal trials (St Pierre & Parente, 2018). The aim of this Chapter was to examine whether a lack of contextual information about TBI (i.e., education materials) accounted for the null effects found in Chapter 6 when the effect of TBI presentation on 'mock' legal decision makers' perceptions of magistrates' sentencing decisions was explored. The inclusion of supporting educational information may serve to increase the salience of TBI to the decision maker and thus increase the visibility of the defendant's TBI. Furthermore, given the potential prejudicial effect of the magistrates' sentencing verdict on participants sentencing ratings which was discussed in Chapter 6, a new and additional sentencing decision timepoint, presented at and *earlier* timepoint (pre-verdict) was included. To explore the effect of contextual information about TBI on sentencing recommendations, three conditions were included. In two conditions, a defendant was presented with a history of TBI, but in one condition this was accompanied by educational materials about TBI, and in the other condition no contextual information about TBI was presented. In the third control condition, no information was presented about brain injury.

Therefore, the primary aim of this experiment was to test the hypothesis that: (1) recommended sentence severity will vary as a function of TBI presentation condition (H1), and (2) sentencing severity will be lower in the *TBI-education* condition compared to the *TBI-no education* condition (H2) and in the *TBI-no-education* compared to the *no- TBI condition* (H3). The secondary aim of this study was to explore how factors - including perceived risk and dangerousness, knowledge and attitudes towards brain injury, and general legal opinions - may also contribute and relate to sentencing decisions. However, prior to testing these hypotheses, a pilot study was conducted to test the suitability of the adapted case materials with the new and earlier decision timepoint.

Pilot Study to Examine a Novel Decision Timepoint and Test the Suitability of New Materials:

7.4 Study Aims

The broader purpose of Experiment 2 was to investigate the effect of introducing educational materials about TBI on participants' sentencing ratings. Whilst this involved a partial replication of Experiment One, some additional materials were included in the fictional magistrates' scenario which needed pilot testing. Therefore, the aim of this pilot study was to test the suitability of an amended fictional case scenario (see Appendix R), and to: (1) to assess possible ceiling or floor effects of a new and additional decision timepoint ('Sentencing Severity' ratings) for the no-TBI (control) condition; (2) use the mean values from this new and additional decision timepoint (Sentencing Severity) to inform subsequent power analysis calculations; (3) to assess how long participants were taking to complete the study, and (4) to examine how accurately participants performed on attentional control check questions, which would inform the exclusion criteria for the subsequent experiment (to aid pre-registration). Similar to the pilot studies conducted for Experiment One (see Chapter 6), the materials trialled here, which contained no information about TBI, would then form the no-TBI condition (control) in the main experiment.

7.5 Methods

7.5.1 Participants

This pilot study followed the same advertising (i.e., Prolific) and pre-screening procedures as pilot study two in Experiment One (see Chapter 6, section 6.13.1), except participants were paid £2.50 in return for participating. A total sample of 40 participants completed the study. Of these participants, n = 31 (77.5%) were female with ages ranging from 18 – 79 (*M* = 32.15, *SD* = 12.42). See Table 7.1 below for further demographic information.

Table 7.1

Summary of Demographic Characteristics

Demographic characteristics	**Prolific Sample (n = 40)**	
	n	**%**
Gender		
Male	8	20.0%
Female	31	77.5%
Prefer not to say	1	2.5%
Ethnicity		
White	35	87.5%
Multiple ethnic groups	1	2.5%
Asian	2	5.0%
Black	1	2.5%

Middle eastern	1	2.5%
Educational attainment		
Secondary School	2	5.0%
Sixth form/ college	9	22.5%
First degree	22	55.0%
Master’s degree	5	12.5%
PhD/ Doctorate	1	2.5%
Other	1	2.5%
Employment status		
Full time employment	18	45.0%
Part-time employment	6	15.0%
Looking for work	3	7.5%
Retired	2	5.0%
Unpaid carer	3	7.5%
Voluntary worker	1	2.5%
Full time student	5	12.5%
Part time student	1	2.5%
Country of residence		
Australia	2	5.0%
Canada	2	5.0%
Ireland	1	2.5%
United Kingdom	34	85.0%

USA	1	2.5%

7.5.2 Design

No experimental manipulations were included in this pilot study. In addition to the 'Sentencing Options' (amended), 'Appropriateness of sentencing' and Consideration of Factors' measures (see Chapter 6, section 6.9.3.2), a new measure of 'Sentencing Severity' was included, which was intended to form the central dependent variable for hypothesis testing in Experiment 2. Attentional control check questions (relating to the case scenario and a video they watched) and additional questions to establish if the participants experienced any issues with the video (e.g., quality of playback, technical issues) were also included. The same four scale measures (JBS, LOC, PBIM, and BIAS), and the perceived dangerousness questions used in Experiment One, were also included so that completion times could be calculated to inform exclusion criteria for Experiment 2.

7.5.3 Materials

7.5.3.1 Fictional Magistrates' Sentencing Remarks

The fictional case materials presented in this pilot study are identical to the materials previously reported in Experiment One for the control condition with one exception. After the aggravating and mitigating factors were presented (in block randomisation), an animated video (1-minute 44 seconds in length) was played and contained information about what people are typically present in a magistrates' court and their roles and responsibilities (see Section 7.8.4 below for full description of the video).

7.5.3.2 Sentencing Severity Variable

A new 'Sentencing Severity' variable was included in this experiment to evaluate the severity of sentence that the participant thought appropriate for the defendant. This was measured immediately after the participant read the sentencing options that were available to the magistrates but before the magistrates' own sentencing verdict was presented (pre-verdict rating). Participants rated how severe or lenient the sentence should be on a seven-point scale (1 = Least severe sentence to 7 = most severe sentence).

7.5.3.3 Appropriateness of Sentencing, Consideration of Factors and Sentencing Options

As previously described in Chapter 6 (see section 6.9.3.2), participants were asked to rate the same 'Appropriateness of Sentencing' and six 'Considerations of Factors' variables. However, a change was made to the 'Sentencing Option Variable' which was extended from four to seven categories, with the following options: (1) A low level community order (whereby the defendant would be required to carry out community service for between 40-170 hours); (2) A low level community order (whereby the defendant would be required to carry out community service for between 171-300 hours); (3) A suspended custodial sentence of up to 13 weeks (with a suspended period of between 6-24 months); (4) A suspended custodial sentence of up to 14-26 weeks (with a suspended period of between 6-24 months); (5) A custodial (prison) sentence of up to 13 weeks; (6) A custodial (prison) sentence from 14 -26 weeks, and (7) Referral to the Crown Court for custodial sentences beyond 26 weeks (up to a maximum of 51 weeks).

7.5.3.4 Attentional Control Check Questions and Video Technical Quality Items

The same three attentional control check questions were included from Experiment One. However, due to the addition of an animated video into the scenario, four additional video attentional control check questions were piloted here. These were: (1) *What colour were the people*?'; (2) '*What legal role was not described in the video?'*; (3) *'What object did you not see in the video?',* and (4) '*Who decides if a supporter can sit with a witness?*

Additional questions were also asked about the video, such as whether participants encountered any technical or quality issues when viewing, which were used to determine subsequent data exclusion rules (see section 7.8.1.1). To assess this, participants were asked to rate the following two questions on a five-point scale (1 = Terrible, 2 = Poor, 3 = Average, 4 = Good and 5 = Excellent): (1) *How was the visual quality of the video (e.g. did you experience any difficulties such as buffering, pixilation?* and (2) *How was the sound quality of the video (e.g. could you hear it ok, was the sound clear and audible?*) A further open-ended question was presented which. asked participants to detail any other technical/quality issues they may have experienced when watching the video.

7.5.3.5 Additional Measures

The LOC, JBS, BIAS20, PBIM and perceived dangerousness (PD) questions (described elsewhere: see Chapters 3, section 3.9.3.4 for LOC; Chapter 5 for PBIM and BIAS, and Chapter 6 section 6.17.8 for JBS and PD questions) were included to simulate all the materials that participants would be completing in the main experiment. Their intended purpose was to gauge a realistic estimate of study completion time from start to finish, to aid development of exclusion criteria. Thus, no analysis of these measures is included in the results section for the pilot study.

7.5.4 Procedure

Ethical approval was granted by Swansea University's Department (now 'School) of Psychology Research Ethics Committee (reference: 3870; see Appendix Y). With the following exceptions, the same procedures were used as described in Experiment One. First, participants were informed that the study would take approximately 25 minutes to complete. The same case materials were presented as the control condition for Experiment One, and similarly, the aggravating and mitigating factors were counterbalanced (i.e., aggravating factor first, mitigating factor first). After the presentation of these, however, participants were presented with the magistrates' video. Participants were asked not to leave their browser whilst watching the video and were asked to press play if the video did not start automatically. Similar to the scenario case information, the video was set with a page timer (timer 104 seconds) so that participants could not progress until this time had elapsed. After the video, participants were presented with the range of sentencing options available to the magistrates for the offence. After they read those sentencing options, participants were asked to rate the severity of sentence (new and additional decision timepoint) they would impose and then indicate their preferred sentencing option (pre-verdict decision). Following this, the magistrates' sentencing verdict was presented. After this point, the remainder of the questions followed the same sequence and order presentation as described for Experiment One - with the addition of the video attentional control check and technical quality questions which followed directly on from the scenario-based attentional control check questions. After participants had completed the experiment, a debrief page was presented to participants which thanked them for their time and explained that the purpose of the experiment was to pilot test fictional case materials for future research.

7.6 Results

7.6.1 Sentencing Severity

Figure 7.1 (below) shows the frequency of responses for each of the 'Sentencing Severity' scale points. The modal response was 2, and the mean was 3.28. Responses were distributed across the whole scale, though with a slight preponderance on the lowest three scale points.

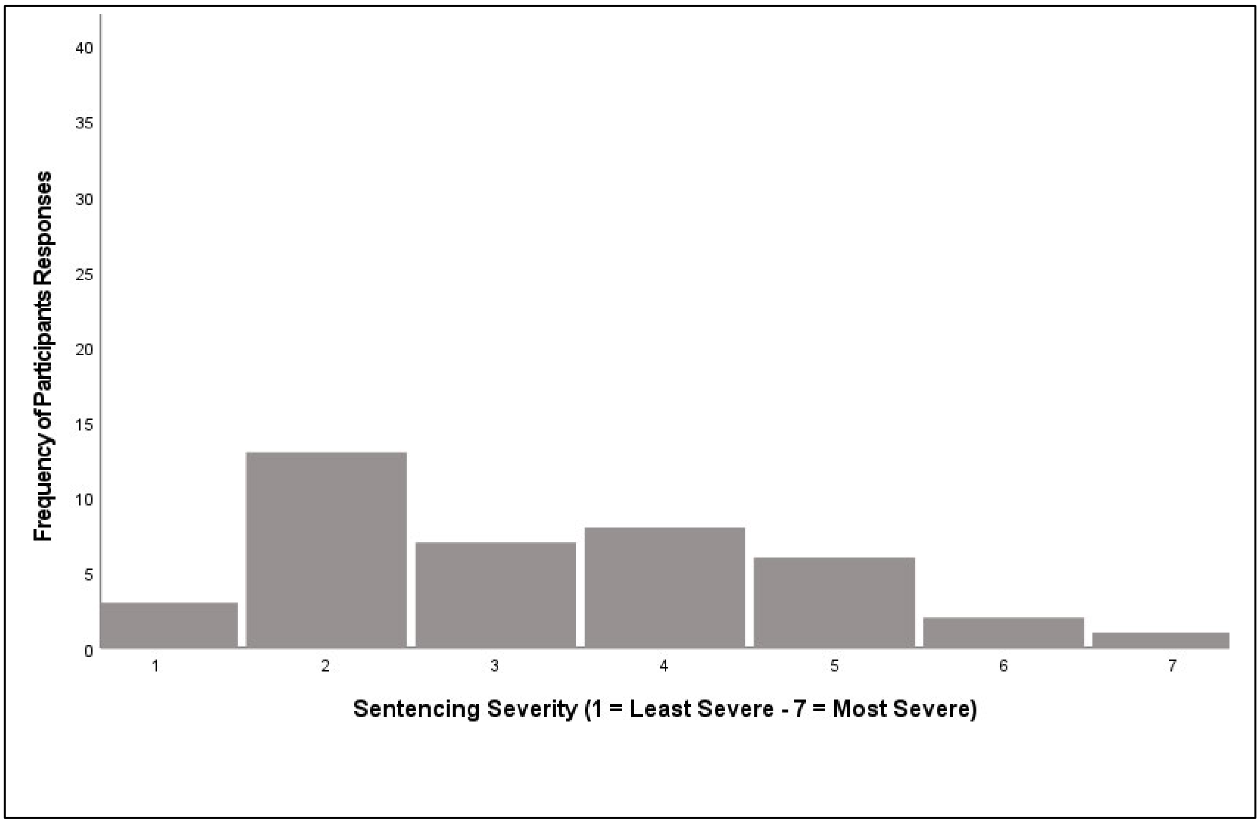

Figure 7.1 *A histogram showing frequency of participants responses to the sentencing severity variable, across scale points 1- 7.*

7.6.2 Sentencing Options

The Sentencing Options variable was presented at three different timepoints: pre-verdict; post-verdict, and post-ratings. Descriptive statistics are presented in Table 7.2. Most participants were consistent in the sentencing option they selected pre-verdict, post-verdict, and post-ratings (75.0% pre-verdict to post-verdict and 77.5% post-verdict to post-ratings). 17.5% (pre-verdict to post verdict) to 20.0% (post-verdict to post- ratings) shifted by one category, and 2.5% (pre-verdict to post-verdict) to 7.5% (post- verdict to post-rating) shifted by two categories.

Table 7.2

Number and Percentage of Participants Selecting Sentencing Options Categories

Sentencing category	Sentencing options pre-verdict n (%)	Sentencing options post-verdict n (%)	Sentencing options post-ratings n (%)
Community order (lower level)	6 (15%)	2 (5%)	1 (2.5%)
Community order (higher level)	11 (27.5%)	12 (30%)	9 (22.5%)
Suspended sentence (lower level)	11 (27.5%)	15 (37.5%)	17 (42.5%)
Suspended sentence (higher level)	4 (10%)	4 (10%)	4 (10%)
Custodial sentence (lower level)	5 (12.5%)	4 (10%)	5 (12.5%)
Custodial sentence (higher level)	2 (5%)	2 (5%)	3 (7.5%)
Crown court	1 (2.5%)	1 (2.5%)	0 (0%)

7.6.3 Appropriateness of Sentencing

Descriptive statistics were calculated for the 'Appropriateness of Sentencing' variable post-verdict and post-ratings (Table 7.3). Histograms for post-verdict and post-ratings are captured in Appendix Z. Mean, mode and median values all cluster around the mid- point of the scale, broadly reflecting the same pattern of results found in Chapter 6.

Table 7.3

Descriptive Statistics of Appropriateness of Sentencing Decision Post- Verdict and Post- Ratings Decision

Descriptives	**Scale point**	**Appropriateness of sentencing - post-verdict**	**Appropriateness of sentencing - post ratings**
Mean		3.73	3.78
Mode		4	4
Median		4	4
Scale point n, (%, cumulative %)			
	Much too lenient	3 (7.5%)	2 (5.0%)
	Moderately too lenient	3 (7.5%)	3 (7.5%)
	Slightly too lenient	2 (5.0%)	3 (7.5%)
	Neither too lenient nor too harsh	26 (65.0%)	26 (65.0%)
	Slightly too harsh	6 (15.0%)	6 (15.0%)
	Moderately too harsh	0 (0%)	0 (0%)
	Much too harsh	0 (0%)	0 (0%)

7.6.4 Aggravating and Mitigating Factors

Descriptive statistics for the aggravating and mitigating factors, which were rated from not at all influential (scale point 1) to extremely influential (scale point 5), are presented in Table 7.4. For all items, participants rated the aggravating and mitigating factors as moderately to very influential in their sentencing recommendation.

Table 7.4

Descriptive Statistics for how Influential each of the Aggravating and Mitigating Factors were in the Participants' Sentencing Ratings

	Aggravating Factors			Mitigating Factors		
	Punched victim 3 times	**Unprovoked attack**	**Caused significant harm**	**First offence**	**Culpability was low for offence**	**Pleaded guilty**
Mean	3.70	3.35	3.98	3.50	3.25	3.33
Median	4	4	4	4	3.50	3.50
Mode	4	4	4	4	4	4
Minimum	1	1	2	1	1	1
Maximum	5	5	5	5	5	5

7.6.5 Data Quality Measures

The next step of analysis focused on the data quality measures that would be included in the main experiment. The same three scenario based attentional control check questions used in Experiment One were included in this pilot. Response accuracy was 97.5% for two items - ‘*Where did the assault take place?’* and ‘*What injury did the victim suffer?’.* The item ‘*What age was the defendant?’* had a 95% response accuracy. The response accuracy reported here represents an improvement on the second pilot study for Experiment One (see Chapter: section 6.14.4).

Four new video attentional control check questions were included for the filler video. Response accuracy was: 70.0% for ‘*What colour were the people*?’, 80.0% for ‘*What legal role was not described in the video?’* 52.5% for *‘What object did you not see in the video?’* and 62.5% for ‘*Who decides if a supporter can sit with a witness?’* Overall, response accuracy was lower than that observed for the scenario-based attentional control check questions, and approximately half of participants selected the incorrect option on one item. For the development of exclusion criteria, the two items with the highest response accuracy were retained for Experiment 2.

Following the selection of the video-attentional control check questions for Experiment 2, further analysis was conducted to develop exclusion criteria which combined the response errors within and across scenario-based and video-based attentional control check questions. This process reflected the same approach adopted for developing scenario-based attentional control check exclusion criteria for Experiment One. Using the three original scenario-based attentional control checks and the two most accurate video-attentional control check questions, response error was: (1) 2.5% for two incorrect scenario responses and one incorrect video response; (2) 0.0% for two incorrect video responses and one incorrect scenario response; (3) 2.5% for two incorrect video responses, and (4) 0.0% for three incorrect scenario responses. Thus, whilst the response accuracy for the video than scenario-based attentional control check questions, when errors were combined across these four categories, the overall response error was low.

The quality of the video (audio and visual) was also evaluated. Participants rated the visual video quality as (1) Average, 2.5%; (2) Good, 30%, and (3) Excellent, 67.5%. Similarly, participants rated the audio quality as: (1) Average, 2.5%; (2) Good, 32.5%, and (3) Excellent, 65% The video quality was mostly rated as at least ‘Good’ by participants, making it suitable for inclusion in Experiment 2. Furthermore, no participants rated the visual or audio quality as Poor or Terrible.

To develop an accurate estimate of completion times for the purpose of pre-registration, completion time was also checked and compared to completion times recorded for Experiment One. For this pilot, the fastest and slowest times were 11m 56 s and 40 m and 49 s respectively. In Experiment One a natural break in timing data for the slowest times were: (1) 33m 58s for the prolific sample, and (2) 40 m 12s for the university sample.

7.7 Pilot Study: Conclusions

The aim of this pilot study was to evaluate the addition of a new decision timepoint presented prior to the magistrates’ sentencing verdict, which would then form the no-TBI (control) condition in the main study. Findings revealed that whilst most participants recommended sentencing severity ratings which were below the midpoint on the scale, there is sufficient scope to detect lower sentencing ratings with the addition of experimental conditions. Thus, it is unlikely that a floor effect is present with this. variable. Additionally, data analysis allowed for the evaluation of the quality control checks (e.g., completion time, video attentional control checks, and video quality control check) measures included here. For completion time, the pilot data likely reflects a good estimate of the upper timing threshold owing to its similarity to university-based data from Experiment 2. Furthermore, no issues were identified with the technical quality of the videos, although response accuracy for the video attentional control checks were lower than for the scenario-based attentional control checks. Consequently, the two most accurate items were selected for use in Experiment 2. Combining attentional control check errors, response errors across a combination of scenario-based and video-based attentional control checks were low. These quality control measures were thus used to inform data exclusion criteria for the pre-registration for Experiment 2.

Main Experiment

7.8 Methods

7.8.1 Pre-Registration

Experiment 2 was pre-registered on the OSF prior to any data collection (http:/osf.io/fg9md). A summary of the key methods included in the pre-registration document is outlined below for: (1) data exclusions; (2) power analysis calculations, and (3) interim and data termination points for sequential analysis.

7.8.1.1 Data Exclusions

The following data exclusions were pre-registered. The same protocol adopted for data exclusions in Experiment One was applied for: (1) language proficiency, and (2) scenario-based attentional control checks embedded PBIM36 and BIAS20. The following additional/amended exclusion criteria were applied:

1. Attentional Control Checks – to accommodate for the new video clip in the materials, new exclusion criteria were applied as follows, if participants either: a) responded incorrectly to two scenario-based checks and one video attentional control check; b) failed three scenario based attentional control checks, or c) failed two video attentional control checks.
2. Completion time – participants who completed the study in less than 8 minutes and more than 41 minutes.
3. Shared an IP address and demographics with another participant in Experiment One and/or in Experiment Two.
4. Rated either the visual and/or the auditory quality of the video as Terrible or Poor.

7.8.1.2 Power Analysis

To achieve 80% power for both contrasts for the one-way between subjects ANOVA, it was necessary to specify power of .895 for each pairwise comparison (.895 x .895 =.80). Power analysis was conducted using the same ANOVA_exact Shiny app (http://shiny.ieis.tue.nl/anova_exact/: Lakens & Caldwell, 2019) used for Experiment One, which can support factorial designs. The Shiny App requires estimated means and standard deviations for each condition as inputs. The inputs for power analysis used pilot study 2 data (*M*= 3.28. *SD*=1.05) for the *no-TBI* condition, with mean values estimated for the remaining two TBI Presentation condition, representing effect sizes of Cohen's *d* = .40. Following the predicted pattern of findings outlined for the study's hypothesis, inputs of *M*=2.86 and *M*=2.44, were included for the *TBI-no-education and TBI-education* conditions respectively. As each pairwise comparison had a predicted direction of effect, one-tailed hypothesis tests were specified. A Bonferroni correction was then applied and as two pairwise contrasts were planned, the alpha level was reduced to .025 (.05/2). This analysis produced a required sample size of 131 per condition, resulting in a total sample size of 393 participants. To allow for data exclusions, the aim was to recruit approximately 432 participants. For a full step-by-step guide to these power analysis calculations, please see the pre-registration document (http:/osf.io/fg9md).

7.8.1.3 Sequential Analysis

The same sequential analysis (see Lakens, 2014) approach used in Experiment One was also adopted here. Two interim data checkpoints were pre-registered: (1) when 50% of the data collection is complete (n = 197 after exclusions, with at least 67 participants in each condition), and (2) when 75% of the data collection is complete (n = 295 after exclusions, with at least 98 participants in each condition). Adjusted *p*-values were calculated using the GroupSeq package for R following the method detailed in the pre- registration (https://osf.io/qtufw/). The resultant adjusted *p* values were: Checkpoint 1 (n = 197) - $p < .0125$ (50% data collection); Checkpoint 2 (n =295) - $p < .0104$, and Full sample (n = 393) - $p < .0120$.

The same stopping rules were applied to each of the interim ‘peeking’ points: (1) *Both* pairwise comparisons are statistically significant; or (2) The effect sizes for *both* pairwise comparisons are smaller than Cohen’s $d = .10$, in which case data collection would be terminated for futility.

7.8.2 Participants

The recruitment and advertising strategy followed the same protocol as described for Experiment One (see Chapter 6, section 6.17.1). Data collection was terminated once the final target sample size was met, as confirmatory analysis conducted at each of the interim (peeking) checkpoints revealed that the stopping rules were not met (see Appendix AA for results at each of these checkpoints). This resulted in a total of N= 487 participants prior to data exclusions. Following the data exclusion criteria outlined previously (see section 7.8.1.1), a total of 82 participants were excluded for the following reasons: (1) IP address duplicates (n= 2); (2) English Language proficiency ratings (n = 7); (3) Video attentional control check fails (n = 39); (4) Video quality ratings (n = 12); (5) completion times. An additional 10 participants were excluded for more than one of the above reasons. A review of completion time data revealed that the pre-registered upper threshold of 41 minutes was too conservative. Data was visually inspected (QQ plots and frequency charts) for a natural breakpoint. This was determined to be 1 hour, 4 minutes and 16 seconds, with responses falling after this breakpoint excluded from analysis.

After exclusions, a final sample of 405 participants was included in the confirmatory analysis. Participants' ages ranged from 18 to 74 years (M = 30.39, SD = 12.10) and 293 participants (72.3%) were female. For further demographic information, see Table 7.5

Table 7.5

Summary of Demographic Characteristics

Demographic characteristics	Sample (N= 405)	
	n	%
Gender		
Male	107	26.4%
Female	293	72.3%
Prefer not to say	1	0.2%
Other gender identity	4	1.0%
Ethnicity		
White	324	80.0%
Multiple ethnic groups	21	5.2%
Asian	32	7.9%
Black	12	3.0%
Latino/Hispanic	6	1.5%
Middle Eastern	1	0.2%
White Sephardic Jew	2	0.5%
African	1	0.2%
Other ethnic group	4	1.0%
Prefer not to say	2	0.5%
Educational attainment		
No formal education	2	0.5%
Secondary School	37	9.1%

Sixth form/ college	106	26.2%
First degree	162	40.0%
Master's degree	79	19.5%
PhD/ Doctorate	17	4.2%
Other	2	0.5%
Employment status		
Full time employment	140	34.6%
Part-time employment	68	16.8%
Retired	10	2.5%
Unpaid carer	5	1.2%
Not working due to disability/health reasons	6	1.5%
Actively seeking employment	23	5.7%
Volunteer	3	0.7%
Full time student	144	35.6%
Part-time student	6	1.5%
Country of residence		
Australia/ New Zealand	13	3.1%
Canada	25	6.1%
Czech Republic	1	0.2%
Croatia	1	0.2%
Finland	1	0.2%
France	3	0.7%
Germany	5	1.2%

Ireland	6	1.4%
Italy	2	0.5%
Norway	2	0.5%
Portugal	3	0.7%
Spain	1	0.2%
Sweden	3	0.7%
United Kingdom	296	73.1%
USA	31	7.7%
Other	12	2.9%

7.8.3 Design

To test the hypothesis that varied TBI Presentation would lead to a difference in sentencing severity ratings, a one-way between subjects' design was used. The independent variable (IV) was TBI Presentation which had three levels: (1) *TBI-education;* (2) *TBI-no-education,* and (3) *no-TBI.* The central dependent variable (DV) was the 'Sentencing Severity' variable presented *prior* to the Magistrates' verdict. Two contrasts were also planned: (1) *TBI-education* vs *TBI-no-education,* and (2) *TBI-no-education* vs *no-TBI.* Additional dependent variables replicated the same measures included in Experiment One. For the first phase of exploratory analysis, these were Appropriateness of Sentencing, Consideration of Factors, Sentencing Options, Perceptions of the Defendant's TBI, and Perceived Dangerousness of the Defendant. Four measures were included for the second phase of exploratory analysis which measured knowledge (PBIM) of, and attitudes (BIAS) towards brain injury, level of proximity to brain injury (LOC), and general legal opinions (JBS).

7.8.4 Materials

7.8.4.1 Fictional Magistrates' Sentencing Remarks

With the following exceptions, the fictional case materials presented in this experiment are identical to the materials previously described for Experiment One (see Chapter 6, section 6.17.8.1). The mitigating information presented to participants about TBI for the *TBI-education* and *TBI-no-education* conditions replicated the same information presented to the *TBI-no-physical* condition in Experiment One (see below).

TBI mitigating factor information:

> "You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. We recognise that your brain injury may have contributed to your actions on the day of the assault."

7.8.4.2 Educational Materials about Brain Injury

Participants in the *TBI-education* condition watched an animated video clip (2 minutes 41 seconds in length) about the causes and consequences of brain injury, published by the Disabilities Trust (https://www.youtube.com/watch?v=Gc2GKDeCKQI&t=2s). This video contains non-narrative (i.e., factually oriented, formal, impersonal) educational information about brain injury. In the video, the main causes of brain injury are outlined along with an explanation of the hidden and long-term effects of brain injury. Animated visual images are accompanied by narrated information about the physical (e.g., sleeping, eating), invisible (e.g., cognitive, emotional difficulties), and social (e.g., returning to work, education) impacts of brain injury. See Figures 7.2 and 7.3 for example animated images contained in the video.

[redacted]

[redacted]

7.8.4.3 Filler Information

A ‘filler’ animated video clip (1-minute 44 seconds in length;) published by the HM Courts and Tribunal Service (https://www.youtube.com/watch?v=-hRTKMhxHoM&t=9s) was presented to participants in the *TBI-no-education* and *no- TBI* conditions. This video was selected to match the style (animated images) and content (factually oriented information) to the experimental video about brain injury. Furthermore, whilst this video contained text rather than narration, audio (i.e., music) was played throughout. This ‘filler’ video contains information about what a person can expect when they go to a magistrates’ court and focused on the people (e.g., magistrates’, legal advisors, defendant, members of the public) typically present in court. See Figures 7.4 and 7.5 for example images from the video.

[redacted]

[redacted]

7.8.4.4 Sentencing Severity, Appropriateness of Sentencing, Consideration of Factors and Sentencing Options

As previously described in Experiment One (see Chapter 6) and the pilot study (see section 7.5.3.3) for this Experiment, the same four variables for Sentencing Severity, Appropriateness of Sentencing, Consideration of Factors and Sentencing Options were used.

7.8.4.5 Additional Questions and Measures

The following measures used in Experiment One were included in Experiment Two: (1) An open-ended question asking participants what information they considered when reaching their decision; (2) Perceived Dangerousness questions (5-items) – internal consistency of these items was good ($\alpha = .81$); (3) Perceptions of the Defendant's Brain Injury questions (5-items); and (4) the PBIM36, BIAS20, LOC and JBS. A full description of each of these measures and questions has been outlined elsewhere in Chapters 3, 5 and 6.

7.8.4.6 Attentional Control Check Questions and Technical Quality Items

The technical quality questions for the video have been described previously (see section 7.5.3.4). The same scenario-based attentional control check questions used in Experiment One were included in this Experiment (see Chapter 6, section 6.14.4). Due to the additional inclusion of a video into the fictional scenario, two video attentional control check questions were also included, but varied according to TBI Presentation condition. For the *TBI-no-education* and *no-TBI conditions,* who were presented with the 'filler' video, the two best performing attentional control check questions were selected from the pilot study (see section 7.6.5). To balance the content of these questions across the two video presentations, questions relating to the TBI educational video were matched in terms of style and content to the piloted magistrates' 'filler' video questions. Table 7.7 shows the two questions presented for each of the two videos (magistrates' filler video, and TBI educational video). Presented in a fixed order to participants, each question has four multiple choice answers, whereby one is correct (see Table 7.6).

Table 7.6

Video Attentional Control Check Questions

Filler Video – Magistrates' Court (Presented to TBI-no-education and no-TBI conditions)		**TBI Educational Video (Presented to TBI-education condition)**	
In the video animation, what colour were the people?	**What legal role was NOT described in the video?**	**What are the main two colours used in the video animation?**	**What cause of brain injury was NOT described in the video?**
Green	Usher	**Blue and Yellow**	Blow to the head
Blue	Prosecutor	Red and Green	Stroke
Red	Legal Advisor	Purple and orange	Tumour
Yellow	**Judge**	Green and black	**Penetrating Injury**

7.8.5 Procedure

Ethical approval was granted by Swansea University, Department of (now 'School') Psychology Research Ethics Committee (reference: 4905; see Appendix BB). The study was advertised in a manner identical to Experiment One and whilst the procedure was largely the same also, there were some minor modifications given changes to the study design. Namely, after the fictional case was presented to participants, block randomisation was again used to assign participants to the experimental condition and counterbalance the presentation order of the Mitigating and Aggravating factors (e.g., aggravating first, or mitigating first). This meant that each participant was randomly assigned to one of the six predetermined blocks (e.g., *TBI-education* condition, aggravating factors presented first). This was done using the randomizer function on Qualtrics, whereby 'Evenly Present Elements' was selected. After this, participants were either presented with the TBI educational video (*TBI-education* condition only) or magistrates' filler video (*TBI-no-education* and *no-TBI* conditions) according to experimental condition. Participants were asked not to leave their browser whilst watching the video and were asked to press play if the video did not start automatically. Similar to the scenario case information, the videos were set with page timers for the TBI educational video (timer 164 seconds) and magistrates' filler video (timer 104 seconds), so that participants could not progress until this time had elapsed.

After the video, participants were presented with the range of sentencing options available to the magistrates for the offence. After they read those sentencing options, participants were asked to rate the severity of sentence (new and additional decision timepoint) they would impose and then indicate their preferred sentencing option (Pre-verdict decision). Following this, the magistrates' sentencing verdict was presented. After this point, the remainder of the questions followed the same sequence, and order presentation, as that presented and described for Experiment One - with the addition of the video attentional control check and technical quality questions which followed directly on from the scenario-based attentional control check items. After participants had completed the experiment, a debrief page was presented to participants. This explained that the purpose of the experiment was to explore the impact of the defendants' brain injury, in addition to contextual (i.e., educational materials) information, on sentencing recommendations.

7.8.6 Statistical Analysis

The statistical analysis procedures follow those of Experiment One for confirmatory analysis (see section 6.17.10). An ANOVA was conducted with two planned pairwise contrasts to test the central hypothesis using an adjusted p-value ($p < .012$) to determine significance (see section 7.8.1.3.) Throughout, parametric tests were performed, and assumption checks were conducted prior to statistical analysis using the same procedures outlined previously (see Chapter 6, section 6.17.10). To note, a violation to the assumption of normality is reported but simulation research shows that ANOVA is robust against violations of normality (Schmider et al., 2010). Thus, no further follow up tests were deemed necessary. In contrast, the approach to some aspects of the exploratory analysis was adjusted from Experiment One. Specifically, given the increased possibility that the independent variable and educational materials (see Chapter 6, section 6.19.2 for context) might influence responses on the

PBIM36 and BIAS20, only JBS scores were included as a covariate in the exploratory ANCOVA analysis. In contrast, PBIM36 and BIAS20 scores were compared across the TBI presentation conditions (one way between subjects ANOVA), with correlational analysis then conducted to explore the relationship between knowledge of, and attitudes towards, brain injury and sentencing recommendations.

In addition, p-values were Bonferroni corrected (.05/ number of conditions) where required to control for the family error rate (FWER) when a family of tests were conducted. Where applicable, adjusted alpha values to determine significance are reported in the results section.

7.9 Results

7.9.1 Phase One of Data Analysis: Confirmatory Analysis

Table 7.7 shows descriptive statistics for each condition for the central dependent 'Sentencing Severity' variable.

Table 7.7

Descriptive Statistics for the 'Sentencing Severity' Central Dependent Variable (Pre- Verdict)

TBI presentation	***M***	***SD***	**n**
No-TBI	3.22	1.23	133
TBI-no-education	3.14	1.23	136
TBI-education	2.77	1.17	136

To test the central hypotheses that lower sentencing severity recommendations would be given for the defendant in the *TBI-education* compared to the *TBI-no- education* condition, and the *TBI-no-education* compared to *no-TBI* condition, a one- way between subject ANOVA was conducted with two planned contrasts (*TBI- education* vs *TBI-no-education* and *TBI-no-education* vs *no-TBI*). A statistically significant main effect of TBI Presentation on the 'Sentencing Severity' ratings was found, $F(2, 402) = 5.21$, $p = .006$, $\eta p^{2\,=}$ .03. The planned contrasts showed that participants recommended less severe sentences in the *TBI-education condition* than in. the *TBI-no-education condition*, p=.007, d = .31 (CI = .07 to .55). This finding supported the first hypothesis, that a defendant with TBI would be evaluated less harshly following a brief educational video about the consequences of TBI. However, the second hypothesis was not supported, as no significant difference was found between the *TBI-no- education* and *no-TBI* conditions, p =.299, d = .06 (CI -.18 to .30). Thus, these findings suggest that participants are only able to adjust their sentencing recommendation to take account of the defendant's TBI when additional information is provided to help participants contextualise the ongoing effects of TBI.

7.9.2 Phase Two of Data Analysis: Exploratory Analysis (Part One)

Similar to Experiment One, exploratory analysis was conducted in two parts. Part 1 focused on analyses that would facilitate interpretation of the confirmatory hypothesis tests.

7.9.3 Consideration of Factors

Descriptive statistics for participants' ratings of the influence of aggravating and mitigating factors presented across all TBI Presentation conditions are presented in Table 7.8. A series of one-way ANOVAs (adjusted p<.008, .05/6) were conducted to evaluate how influential participants rated each of the aggravating and mitigating factors across TBI Presentation conditions. Levene's test revealed a violation to the homogeneity of variance assumption (p>.05) for two mitigating factors (Items 4 and 6), thus Welch's F, a more robust test, was used to determine significance for these. Overall, no significant differences were observed between TBI Presentation conditions and ratings of the aggravating and mitigating factors.

Table 7.8

Descriptive Statistics and ANOVA Tests for each Aggravating and Mitigating Factor Revealing How Influential these were in Determining Sentencing Recommendation across TBI Presentation Conditions

		No-TBI (n = 133)	**TBI no-education (n = 136)**	**TBI education (n= 136)**	**One-way ANOVA**		
		M (SD)	*M (SD)*	*M (SD)*	$F(2, 402)$	*p*-value	ηp^2
Aggravating factors							
1	Punched victim 3 times	3.74 (0.94)	3.63 (1.07)	3.64 (0.92)	0.48	.622	0.002
2	Unprovoked attack	3.60 (1.03)	3.58 (1.03)	3.35 (0.99)	2.50	.083	0.012
3	Caused significant harm	3.86 (0.94)	3.97 (0.92)	3.71 (0.95)	2.59	.076	0.013
Mitigating factors							
4	First offence	3.84 (0.96)	3.57 (1.14)	3.55 (1.05)	3.57^a	.030	-
5	Culpability low for offence	3.55 (1.08)	3.21 (1.18)	3.22 (1.14)	3.94	.020	0.019
6	Pleaded guilty	3.74 (1.06)	3.44 (1.23)	3.64 (1.05)	2.27^b	.105	-

Note: [a]Welch's *F* adjusted *df*= 2, 267.16, [b]Welch's *F* adjusted *df*= 2, 266.97

An independent samples t-test was conducted to examine how influential the *TBI- education* and *TBI-no-education* conditions found the TBI mitigating factor. Levene's test for the equality of variance was significant (p<.001) thus the t-test where 'equal variance not assumed' is reported here. Findings revealed that participants in the *TBI- education* condition (M = 4.11, SD = 0.96) found the TBI mitigating factor more influential in their sentencing decision compared to *TBI-no-education* (M = 3.75, SD = 1.19), t(257.91) = 2.75, p=.006 (two-tailed), Cohens d= .33 (CI = .09 to.57).

7.9.4 Appropriateness of Sentencing (Post-Verdict and Post-Ratings)

The same 'Appropriateness of Sentencing' dependent variable was presented to participants as in Experiment One, across two decision timepoints which were post-verdict (i.e., after the magistrate's sentencing verdict was presented) and post-ratings (i.e., after participants rated the aggravating and mitigating factors). A two-way mixed ANOVA was conducted to assess the effect of TBI Presentation (between subjects' independent variable with three levels: *TBI-education, TBI-no-education* and *no-TBI)* and decision timepoint (within subjects' independent variable with two levels: *post- verdict* and *post-ratings*) on appropriateness of magistrates' sentencing dependent variable. First, skewness and kurtosis values were checked for each condition and whilst skewness values were within acceptable parameters, most kurtosis values were above +2 (see Appendix CC) - although no adjustment was made to the analysis as a result (see section 7.8.6 for explanation). Following the same pattern of findings reported for Experiment One (see section 7.9.1) no significant main effect was found between the *no-TBI* (*EMM* =3.97, *SE* = 0.08*)*, *TBI-no-education* (*EMM* = 3.95, *SE* = 0.08*)* and *TBI-education* (*EMM* = 4.18; *SE*= 0.08) conditions, $F(2, 402) = 2.85$, $p = .059$, $\eta p^{2} =$ .01. However, appropriateness ratings were significantly lower after participants considered the aggravating and mitigating factors (*EMM* = 3.99, *SE* = 0.04) than before they considered them (*EMM* = 4.07, *SE* = 0.05), $F(2, 402) = 8.68$, $p = .003$, $\eta p^{2} =$ .02. No significant interaction between TBI presentation and decision timepoint was found, $F(2, 402) = 0.52$, $p = .598$, ηp^{2} =003. Therefore, and replicating the same pattern of findings found in Experiment One, TBI Presentation did not have a significant effect on appropriateness ratings, and no significant interaction was found. However, the magistrates' verdict was viewed as more lenient after participants had considered the individual aggravating and mitigating factors in the case.

7.9.5 Sentencing Options Across Three Decision Timepoints

The next set of analyses was conducted to ascertain if sentencing responses differed across the three timepoints (pre-verdict, post-verdict, and post-ratings) as a function of either viewing the magistrates' own sentencing verdict, or after considering each of the individual aggravating and mitigating factors. The number and percentage of participants opting for each of the four sentencing categories across each timepoint and TBI condition is presented in Table 7.9.

Table 7.9

Descriptive Statistics of Sentencing Option Pre-Verdict, Post-Verdict and Post-Ratings

Sentencing option	**Sentencing level**	**Sentencing option decision pre-verdict**			**Sentencing option decision post-verdict**			**Sentencing option decision post-ratings**		
		No-TBI	TBI-no-education	TBI-education	No-TBI	TBI-no-education	TBI-education	No-TBI	TBI-no-education	TBI-education
Community order n (%)	Lower	17 (12.8%)	18 (13.2%)	27 (19.9%)	8 (6.0%)	13 (9.6%)	17 (12.5%)	6 (4.5%)	9 (6.6%)	12 (8.8%)
	Higher	46 (34.6%)	42 (30.9%)	42 (30.9%	38 (28.6%)	40 (29.4%)	37 (27.2%)	32 (24.1%)	29 (21.3%)	35 (25.%)
Suspended sentence n (%)	Lower	45 (33.8%)	47 (34.6%)	43 (31.6%)	62 (46.6%)	55 (40.4%)	53 (39.0%)	67 (50.4%)	68 (50.0%)	58 (42.6%)
	Higher	13 (9.8%)	19 (14.0%)	16 (11.8%)	8 (6.0%)	19 (14.0%)	22 (16.2%)	10 (7.5%)	21 (15.4%)	23 (16.9%)
Custodial sentence n (%)	Lower	5 (3.8%)	4 (2.9%)	6 (4.4%)	11 (8.3%)	5 (3.7%)	5 (3.7%)	12 (9.0%)	4 (2.9%)	5 (3.7)
	Higher	3 (2.3%)	5 (3.7%)	2 (1.5%)	3 (2.3%)	3 (2.2%)_	1 (0.7%)	3 (2.3%)	4 (2.9%)	2 (1.5%)
Crown court n (%)	-	4 (3.0%)	1 (0.7%)	0 (0.0%)	3 (2.3%)	1 (0.7)	1 (0.7%)	3 (2.3%)	1 (0.7%)	1 (0.7%)

First, three ordinal regressions were conducted to explore if TBI Presentation was associated with the sentencing options selected by participants at each sentencing option timepoint. No significant improvement in the fit of the null model was observed by including the predictor variable TBI Presentation pre-verdict (X^2 (10) =9.28, p=.505), post-verdict (X^2 (10) =15.69, p=.109), or post-ratings (X^2 (10) =15.74, p=.107). Second, a series of chi-square tests of independence (adjusted p<.017, .05/3) were performed to investigate if a change in sentencing option across the three timepoints was associated with TBI Presentation condition. To do this, three new 'Shift in sentence' categorical (change vs no change) variables were computed to compare sentencing options selected between: (1) pre-verdict and post-verdict; (2) post-verdict and post-ratings, and (3) pre- verdict and post-ratings. Consequently, 2 (Shift in sentence: no change vs change) x 3 (TBI Presentation: *TBI-education*, *TBI-no-education*, and *no-TBI*) chi-square tests of independence were conducted. Overall, there was no significant association between TBI Presentation and sentence change from pre-verdict to post-verdict (X^2(2) = 4.67, p=.097), post-verdict to post-ratings (X^2(2) = 0.80, p=.670), or pre-verdict to post- ratings (X^2(2) = 3.93, p=.140). Therefore, TBI was not associated with the sentencing options participants selected, nor with any shifts in sentencing options across the three timepoints.

7.9.6 Perceptions of the Defendant's Brain Injury

Participants in the two TBI conditions were asked five additional questions pertaining to their perceptions of the defendant's brain injury. A series of *t*-tests (adjusted p<.01,.05/5) were conducted to evaluate if perceptions of brain injury varied based on whether participants had received the educational video or not. No significant differences were found in perceptions of the defendant's brain injury when the *TBI-education* condition was compared to the *TBI-no-education* condition (see Table 7.10). Thus, participants perceived the defendant's brain injury similarly, irrespective of whether participants viewed educational materials about brain injury.

Table 7.10

Descriptive Statistics for Additional TBI Questions for the Two TBI Experimental Conditions

Perceptions of defendants TBI	**TBI-no-education**	**TBI-education**	**t-test**		
	M (SD)	*M (SD)*	*t*(270)	*p*-value	Cohen's *d*
The defendant has made a good recovery	3.88 (1.11)	3.90 (1.11)	-0.16	.874	.02
The defendant's brain injury has had a big impact on their daily life.	5.38 (1.26)	5.37 (1.06)	0.05	.958	.01
The defendant has sustained a severe brain injury.	5.42 (1.35)	5.45 (1.29)	-0.18	.854	.02
The defendant is going to make a full recovery in the future.	4.09 (1.15)	3.88 (1.12)	1.50	.135	.18
The defendant is still experiencing ongoing issue as a result of their brain injury.	5.79 (1.04)	5.64 (0.96)	1.21	.226	.15

7.9.7 Perceptions of the Defendant – Perceived Dangerousness

The next set of exploratory analysis focused on perceptions of risk and dangerousness across the experimental conditions. Descriptive statistics for Perceived Dangerousness total score and individual items are presented in Table 7.11

Table 7.11

Descriptive Statistics for Perceived Dangerousness Total Scores for the TBI Presentation Conditions

Perceived dangerousness question	**No-TBI** *M (SD)*	**TBI-no-education** *M (SD)*	**TBI-education** *M (SD)*
Total score	17.60 (5.99)	17.20 (4.97)	15.99 (4.52)
The defendant should be considered a danger to society	3.05 (1.47)	3.07 (1.45)	2.78 (1.27)
The defendant has a criminal personality	2.71 (1.21)	2.31 (1.21)	2.07 (1.14)
The defendant has a violent personality	4.07 (1.46)	3.16 (1.51)	2.89 (1.38)
The defendant is likely to re-offend	3.44 (1.35)	3.67 (1.28)	3.56 (1.26)
The defendant's behaviour is unpredictable	4.32 (1.54)	4.99 (1.31)	4.69 (1.39)

To examine if Perceived Dangerousness scores were impacted by TBI Presentation, a one-way between subjects ANOVA was conducted. Levene's test showed that the homogeneity of variance assumption was violated so a more robust test, Welch's *F* was used to interpret the findings. A significant main effect of TBI Presentation was found on Perceived Dangerousness scores, F (2, 263.87) = 3.83, p =.023. Bonferroni corrected post hoc comparisons revealed that perceived dangerousness scores were significantly lower for the *TBI-education* compared to *no-TBI condition* (*p*=.033). The differences between the *TBI-education* and *TBI-no-education* (*p*= .164) and between the *TBI-no-education* and *no-TBI* conditions (*p* > .99) were not statistically significant. Thus, lower perceived dangerousness scores were only found when the *TBI- education* condition was compared to the *no-TBI* condition.

7.9.8 Phase Three of Data Analysis: Exploratory Analysis (Part Two) with LOC, JBS, PBIM36 and BIAS20 Measures

The second part of exploratory analysis evaluated if factors such as level of proximity (LOC), knowledge of, attitudes towards brain injury, and general legal opinions (JBS) may have contributed to severity ratings. Following the data quality protocol outlined in the pre-registration document, one further exclusion criterion was applied at this point – participants (n=30) who failed one or more of the five attentional control checks embedded in the PBIM36 (three attentional control checks) or BIAS20 (two attentional control checks) were excluded. Thus, a sub-set of n= 375 participants (n = 127 for *TBI- education*, n = 125 for *TBI-no-education*, and n = 123 for *no-TBI*) remained. See Appendix DD for demographic details of this subset of participants.

7.9.9 LOC and TBI Presentation

To determine if levels of proximity to brain injury were contributing to the difference observed between the *TBI-education* and *TBI-no-education* conditions when sentencing severity ratings were compared, LOC scores were assessed across each of the TBI conditions. The LOC is ranked from 1 to 12 (low - high proximity to brain injury) and, like Experiment One, the modal rank was 4 (‘*I have watched a documentary on the television and internet about brain injury’*). LOC scores were then categorised into ‘low,’ ‘medium’ and ‘high’ categories and the ‘low’ category was the modal rank for all TBI Presentation conditions (see Table 7.12). As expected, and in line with Experiment One, a chi-squared test of independence confirmed there was no association between TBI Presentation and LOC Categories, $X^2(4) = 2.04$, $p < .728$. Thus, it is unlikely that levels of proximity impacted the study’s original findings that education materials reduced sentencing severity ratings.

Table 7.12

Percentage of Participants in the LOC Categories for the TBI Presentation Conditions

LOC category	No-TBI n (%)	TBI-no-education n (%)	TBI-education n (%)
Low[a]	78 (58.6%)	77 (56.6%)	86 (63.2%)
Medium[b]	23 (17.3%)	26 (19.1%)	21 (15.4%)
High[c]	32 (24.1%)	33 (24.3%)	29 (21.3%)

[a]Low LOC category = ranks 1-4, [b]Medium LOC category = ranks 5- 8, [c]High LOC category = ranks 9-12.

7.9.10 The Effect of Legal Opinions on Sentencing Severity Ratings

Analysis of co-variance (ANCOVA) was conducted to explore whether the addition of legal opinions (JBS scores) as a covariate may have affected the main findings that *TBI- education* resulted in lower sentencing severity ratings compared *TBI-no education*. Replicating confirmatory analysis, a significant effect of TBI Presentation on sentencing severity was found when JBS scores were entered as a covariate, $F(2, 371) = 3.94$, $p = .020$, $\eta p2 = .02$. JBS total scores had a significant positive relationship with sentencing severity ratings, $F(1, 371) = 28.33$, $p < .001$, $\eta p2 = .07$, where higher sentencing severity scores were related to higher pro-prosecution attitudes. As with the confirmatory analysis, estimated marginal means (EMM) were significantly lower ($p = .01$, one-tailed) for *TBI-education* (*EMM* = 2.77, *SE* =0.10) compared to *TBI-no-education (EMM = 3.09, SE* = 0.10), and no significant difference ($p = .408$, one-tailed) was found between *TBI-no-education (EMM* = 3.07, *SE* = 0.10) and *no-TBI* (*EMM* =3.13, *SE* = 0.10). Overall, and replicating the study's central findings, the addition of educational materials led to significantly lower sentencing severity ratings when the defendant was presented with a brain injury, even when controlling for legal opinions. As anticipated, stronger pro-prosecution attitudes were related to more severe sentencing ratings.

7.9.11 Relationship between Sentencing Severity and Knowledge of, and Attitudes towards, Brain Injury

As outlined in the statistical analysis section (section 7.8.6), a one-way between subjects ANOVA was first conducted to explore if PBIM36 or BIAS20 scores differed across the TBI Presentation conditions. No significant differences were found (see Table 7.13).

Table 7.13

PBIM36 and BIAS20 Scores for each TBI Presentation Condition

Measure	**No-TBI (n = 123)**		**TBI-no-education (n = 125)**		**TBI-education (n= 127)**		***F*(2, 372)**	***p*-value**	**ηp^2**
	M	*SD*	*M*	*SD*	*M*	*SD*			
PBIM36 Total score	168.22	17.06	169.92	22.56	171.01	18.20	0.65	.521	.003
BIAS20 Total score	100.43	12.57	100.07	12.620	100.42	11.09	0.04	.965	.000

A series of Pearson's correlations (two-tailed) were then conducted between sentence severity ratings and PBIM36 (total and subscale) scores (adjusted $p < .07$, .05/7). Overall, only PBIM36 total and 'Social determinants of brain injury' subscale scores were significantly negatively related to sentencing severity ratings, such that higher levels of knowledge were related to lower sentencing recommendations. In both instances however, the relationship was weak (< .3; see Table 7.14).

Table 7.14

Correlations between PBIM36 (Total and Subscales) and Sentencing Severity Ratings

PBIM	M	SD	Pearson's correlations	
			r(df = 373)	*p*-value
PBIM36 Total	169.73	19.40	-.14	.006
Signs and symptoms of brain injury	61.23	8.75	-.10	.067
Social determinants and consequences of brain injury	16.87	3.96	-.15	.003
Severity and impact of brain injury	29.64	4.71	-.12	.021
Insight	28.42	5.50	-.07	.199
Permanence of brain injury	12.89	3.10	-.07	.188
Physical and medical expectations	20.69	4.58	-.04	.402

Second, the relationship between sentence severity ratings and BIAS20 total and subscale scores were explored, again with a series of Pearson's correlations (adjusted $p < .01$, .05/5). Overall, only BIAS20 total, 'Social Inclusion' and 'Genuineness' subscale scores were significantly negatively related to sentencing severity ratings, such that more positive attitudes were related to lower sentencing recommendations. As with the PBIM36, relationships were however weak (< .3; see Table 7.15).

Table 7.15

Correlations between BIAS20 (Total and Subscales) and Sentencing Severity Ratings

			Pearson's correlations	
BIAS	**M**	**SD**	***r*(df = 373)**	***p*-value**
BIAS20 total	100.31	12.08	-.15	.004
Social inclusion	33.30	5.61	-.14	.005
Empathy	25.35	4.08	.01	.797
Genuineness	19.14	3.91	-.16	.002
Risk and dangerousness	22.52	4.39	-.10	.065

7.10 Discussion

Educational information about brain injury may be important for legal decision makers to take full account of a defendant's TBI disability in sentencing decisions. Therefore, the central hypothesis aimed to examine the effect of providing non-narrative (i.e., factually oriented) educational information about the consequences of TBI on sentencing severity ratings, in a sample of 'mock' legal decision makers, when defendants were presented with a history of TBI. To investigate this, TBI Presentation varied across two experimental conditions. In the first, a video explaining the consequences of TBI was presented in addition to a description of the defendants TBI, whereas the second a filler video was presented instead which explained what a person can expect when they go to a magistrates' court. These conditions were compared to a control condition, in which there was no mention of TBI. Supporting the first hypothesis, the inclusion of educational materials about TBI led to lower sentencing severity ratings. However, in the absence of educational information, sentencing severity ratings did not significantly differ between a defendant presented with and without a history of TBI.

In Experiment One (see Chapter 6), two explanations for the null effect of TBI presentation on appropriateness of sentencing recommendations were proposed. The first potential explanation was that TBI disability remained invisible to decision makers because case materials lacked sufficient contextual information about TBI. By increasing contextual understanding of TBI disability with an educational video explaining the causes and consequence of brain injury, participants may subsequently adjust their sentencing decision to a more lenient position in their sentencing recommendation.

The results of Experiment Two provide support for this hypothesis. The introduction of educational materials led participants to recommend a less severe sentencing. Furthermore, in the absence of educational information, sentencing severity recommendations were similar for a defendant with and without a history of TBI – and this effect was also robust to the inclusion of legal opinions as a covariate. More accurate knowledge of TBI and positive attitudes towards those with brain injury was also weakly related to sentencing recommendations, albeit largely driven by more accurate understanding of the social factors contributing to TBI and more socially inclusive attitudes and beliefs that those with brain injury are genuine about their symptoms. However, the weak relationship is likely explained by the multitude of factors that contribute to the sentencing recommendation, including legal opinions which was a strong predictor, and each of the core aggravating and mitigating factors which were considered at least moderately influential by participants when reaching their decision – although no differences were observed for these latter factors across the TBI Presentation conditions. Notably, however, participants rated the TBI mitigating factor as more influential in their sentencing severity recommendation when presented with additional educational information about TBI. Even so, the preferred sentencing options did not differ by TBI Presentation at any of the three decision timepoints (pre- verdict, post-verdict, and post-rating). However, due to its categorical nature, the sensitivity of this variable may not have been sufficient to detect group differences. In sum, providing contextual information about TBI appears to support participants to take account of the TBI information presented to them about the defendant, leading to an adjustment to the sentencing recommendation. However, as the defendant's brain injury and level of dangerousness was perceived similarly irrespective of contextual information about TBI, the underlying mechanisms explaining why contextual information leads to an adjustment to the sentencing recommendation remains unclear.

On the basis that inclusion of the magistrates' sentencing verdict may have provided an anchor value to participants (see Bystanowski et al., 2021), an anchoring effect was also considered as a potential explanation for the null findings in Experiment One. However, the same null effect was observed here when the sentencing decision was made after the presentation of the magistrate's verdict. Additionally, and in contrast to the findings in Experiment One, pro-prosecution attitudes were positively related to sentencing severity ratings, measured prior to the magistrates' sentencing verdict in this Experiment. In line with this, previous research has found that when trial information is ambiguous, and without presentation of an anchor value, legal opinions are strong predictors of legal decisions (de la Fuente et al., 2003). Although, after viewing the magistrates' verdict, the same pattern of findings found in Experiment One was found for sentence appropriateness ratings, with participants generally in agreement with the magistrates' verdict both before and after presentation of individual aggravating and mitigating factors. Thus, these findings collectively suggest that both explanations for the findings in Experiment One are likely. That is, without educational material to provide contextual information, the effects of TBI remain invisible to observers when sentencing severity ratings are measured pre-verdict. Equally, an anchoring effect was also likely present in Experiment One post-verdict as the magistrates' verdict similarly provided an anchor point to participants in this Experiment. Consequently, the presentation of the magistrates' verdict before reviewing any participants' decisions likely led to a prejudicial effect on sentencing ratings in Experiment One.

General education interventions have been shown to increase knowledge and understanding of TBI (e.g., Rice, 2018, Schellinger et al., 2018), and preliminary evidence also suggests that educational material may alter perceptions of defendants with TBI (St Pierre & Parente, 2018). However, in Schellinger et al.'s (2018) study, the educational materials combined personal narratives (i.e., lived experience) about TBI with expert information. Additionally, and partly based on vignettes described in McClure et al. (2006), De Iorio et al. (2017) explored the role of different types of educational information on misconceptions and attributions about the causes of TBI-related behaviour. They found that participants who read either a factsheet about TBI or personal story endorsed fewer misconceptions and were also more likely than a control group (no education) to attribute an adolescent's behavioural change to their TBI rather than other factors, such as age. Thus, both forms of educational materials appeared to lead participants to place more emphasis on the TBI, but perhaps surprisingly, little difference was found between the factsheet and personal story. However, further analysis revealed that personal stories led to lower endorsement of the adolescent explanation compared to when they read the control information. However, this effect was not found when the factsheet was presented. Thus, educational materials based on personal narratives were more effective in reducing the adolescent explanation of behaviour, and proportionally, the TBI explanation was more likely to be endorsed. Following these findings, further research is needed to explore the effect of personal narratives, in addition to factual information about TBI, in the context of the legal decisions and sentencing recommendations.

7.10.1 Limitations

Finally, whilst a rigorous approach to research methodology was adopted to this study, there are some limitations which need to be acknowledged. In addition to the potential lack of sensitivity of the sentencing options variable to detect differences between TBI Presentation conditions, the underlying mechanisms involved in explaining how education led to lower sentencing severity decision remains unclear. In this experiment, participants perceived the severity and impact of the defendant's brain injury similarly irrespective of educational materials, and perceived dangerousness ratings only differed between a defendant with and without a history of TBI when the TBI information was accompanied by educational materials. Consequently, further investigation is needed to consider factors which may be involved in explaining the effect of TBI educational information on sentencing decisions. Finally, although no differences between PBIM36 and BIAS20 scores were observed across the TBI Presentation conditions, one further limitation is that the sequence of the experimental design could be improved so that measures (i.e., PBIM36 and BIAS20) are included at a pre-test (baseline) stage (e.g., Murphy et al., 2013; Rice, 2018), and prior to any critical experimental manipulation (e.g., educational materials; TBI information). Including these at a pre-test stage, and ideally with a sufficient interval prior to experimentation (i.e., one to two weeks prior), would serve to provide a valuable baseline measure of knowledge of, and attitudes towards, brain injury, as well as ensure that responses were unaffected by experimental manipulations. Although, for the experimental design adopted here, it was not feasible to include a pre-test phase given the sample size requirements and other considerations outlined previously.

7.10.2 Conclusions

This experiment explored the effect of contextual information about TBI on sentencing severity ratings in a sample of 'mock' legal decision makers drawn from the general population. Watching an educational video about TBI led to less severe sentencing recommendations compared to when no educational material was presented. In the absence of this educational material, sentencing recommendations were similar for defendants with and without a TBI. Thus, it appears that without additional contextual information to enable laypersons to understand the severity and impact of TBI disability, that TBI related information may not be fully factored into sentencing type recommendations. Even so, it is unknown at this stage whether the type of educational materials presented about TBI matters. Indeed, previous research has included personal stories about TBI in their education materials, either combined with, or separate to factual information (e.g., De Iorio et al., 2017; Schellinger et al., 2018), with some evidence that the former may be more influential and efficacious. Thus, a third experiment will explore whether the format and type of educational material presented matters, such as the effect of including a personal story of the consequences of TBI to examine if this also impacts on sentencing severity ratings (see Chapter 8). Furthermore, as the results presented here were unable to elucidate the mechanisms that may underpin the effect of education on sentencing ratings, the next experiment will further consider other factors which may underpin and help explain the observed relationship between education and sentencing decisions in Experiment Two.

Chapter 7: Key Messages

- This study aimed to explore how the addition of educational materials about brain injury, in addition to a description of the defendants TBI, influenced 'mock' legal decision maker's sentencing severity ratings when compared to a description alone, or when no information about TBI was presented.
- The addition of education materials led to lower sentencing severity ratings for a defendant with TBI. However, when educational information was absent, a description of the defendant's TBI did not alter sentencing ratings compared to when no TBI information was presented.
- Findings suggest that educational materials may be important for legal decision makers to take full account of TBI disability. However, further research is needed to determine whether type/format of education matters, as well as the reason why educational materials exerted an effect on sentencing decisions.

Chapter 8 Experiment 3

Traumatic Brain Injury in the Magistrates’ Court: How do Different Types of Education and Contextual Information Affect Sentencing Recommendations?

8.1 Chapter Overview

In Chapter 7, an experiment was conducted to examine the effects of presenting educational materials, in addition to presenting information about the defendants TBI, on sentencing severity ratings in a sample of ‘mock’ legal decision makers drawn from the general population. The results revealed that educational materials to contextualise and increase the visibility of TBI related disability led to lower sentencing ratings. Similarly, and reflecting the findings observed in Experiment One, an absence of educational information meant a defendant with a history of TBI was rated similarly to a defendant with no history of TBI. Consequently, educational materials provided important contextual information about TBI, thus enabling participants to adjust their sentencing decision to take account of the TBI-related information. The educational materials used in Experiment Two contained non-narrative educational information about TBI, which may be less impactful than materials which capture the lived experience of those with TBI (i.e., a personal narrative). Thus, the aim of this study was to investigate the impact of different types of educational information about TBI, including a personal narrative.

8.2 Impact of Different Types of Educational Information

In fields where persuasive messaging and communication is important (e.g., marketing, charity fundraising, health promotion campaigns), the role and effectiveness of different types of educational information have been explored (e.g., Das et al., 2008; Murphy et al., 2013; 2015). For instance, in a sample of 758 women, Murphy et al. (2013) explored the efficacy of narrative (i.e., personal story, lived experience) versus non-narrative (i.e., factually oriented, impersonal) films for improving knowledge, attitudes and behavioural intentions towards cervical cancer. Whilst both films increased knowledge, improved attitudes, and led to more supportive views about cervical screening overall compared to pre-intervention baseline levels, the narrative stories were found to be more effective than the non-narrative, factual film. In a follow-up study, Murphy et al. (2015) subsequently found that whilst narrative and non-narrative films both produced significant increases in cervical cancer related knowledge and attitudes at two-weeks and six-months following intervention, the health messages contained in the former were more memorable. Specifically, women who saw the narrative video were more likely to have scheduled or completed a Pap test at six months. Therefore, even though the videos were similar in length and contained comparable factual information, the personal narrative was more effective and more likely to be retained over a period of several months. In another example, Das et al. (2008) found that narrative stories were effective at increasing awareness of hepatitis B virus in men deemed at high risk of infection, and they also increased the intention to receive a vaccination.

However, whilst narrative personal stories may increase positive health behaviours, the evidence is not unequivocal. In certain contexts, such as public health emergencies, personal narratives have been found to be less effective than non-narrative, factually oriented information (Bekalu et al., 2018). Furthermore, research examining the effect of educational information in relation to the visibility of TBI disability, found an equivalent effect on attributions of behaviour (i.e., behaviour could either be attributed to adolescence or TBI) when either a personal story or a factsheet about TBI was presented (De Iorio et al., 2017). Although further analysis showed that personal narratives of TBI led to lower endorsement of the adolescent explanation of behavioural change when compared to the control condition. Thus, whilst previous research has yielded mixed findings, De Iorio et al.'s (2017) research indicates that a personal narrative may be a powerful tool to increase the salience of a key message about TBI.

One reason why narratives may be more effective in communicating key messages in certain contexts, is that personal stories 'transport' an individual into the lived experience of others (Green & Brock, 2000; Green et al., 2004). As a consequence of this 'transportation,' messages may be harder to discount and easier to process (Kreuter et al., 2007). Furthermore, being transported into others' experiences may elicit a stronger emotional response, creating greater connectivity with the narrator (Kreutzer et al., 2007; Murphy et al., 2013). Thus, in the context of legal decision research, it is important to consider whether a personal narrative about the consequences of TBI (e.g., someone's lived experience) has a greater effect on sentencing recommendations compared to factually oriented non-narrative information.

8.3 Blame Attributions and Empathy Towards Defendants

In Experiment Two (see Chapter 7) exploratory analysis showed participants did not perceive the impact and severity of the defendant's TBI any differently when additional education information was included. Similarly, perceptions of dangerousness were similar for defendants who presented with TBI, irrespective of whether educational information was presented. Although, Experiment Two also showed that when accompanied by educational materials, a defendant with TBI was viewed as less dangerous than a defendant with no history of TBI. Even so, the mechanisms that underpinned the difference in sentencing recommendation between a defendant with TBI, with and without accompanying educational information, remain unclear. Consequently, it is important to consider other factors that may be involved in sentencing deliberations and recommendations. Two such factors are blame attributions and empathy, including both trait (i.e., the participants general empathy levels) and state (i.e., towards the defendant) levels of empathy (Feigenson, 2016; J. L. Wood et al., 2014).

Empathy has been found to play a mediating role in how information about a defendant is evaluated in fictional criminal trials (J. L. Wood et al., 2014). For example, research by Colby (2012) and Chin (2012) found that participants with high trait levels of empathy endorsed less severe punishments and were also less likely to perceive the defendant as responsible for the crime. Likewise, J. L Wood et al. (2014) also found empathy to play an important role in how mock jurors perceive trial outcomes and verdicts, albeit trait and state empathy were found to exert different effects. Namely, participants with higher levels of trait empathy were more likely to believe that a defendant was remorseful for their actions despite no evidence to support this. Higher state empathy, on the other hand, was associated with a higher likelihood that the participant would disagree with a guilty verdict. Thus, *state* empathy was more important than *trait* empathy for evaluations of the trial information and subsequent legal judgements (J. L. Wood et al., 2014). As such, it is important to consider how empathy affects legal judgements (Bandes & Blumenthal, 2012) whilst recognising that state and trait empathy may have different effects on sentencing judgements.

Although, the degree to which decision-makers blame the defendant for their actions may also impact on legal judgements and decisions (Feigenson, 2016). For example, Bright and Goodman-Delahunty (2006) examined the role of gruesome photographs in trial evidence, finding, perhaps unsurprisingly, that participants had stronger negative emotional reactions to gruesome photographs than to neutral or no photographs. However, they also found that the presentation of gruesome photos led to higher levels of blame and in turn, more severe legal judgements (i.e., conviction). Further, in a study examining the impact of a defendants' mental illness on verdict decisions, Jung (2015) found that when blame attributions were viewed as external to the defendant, a lower sentencing verdict was given. Thus, such evidence suggests that particular forms/types of information, including educational materials, may result in higher/lower blame attributions. Therefore, perceptions of blame are important to consider in the context of a defendant with TBI.

In light of the above, this study aimed to investigate whether different types of educational information about TBI affects sentencing ratings, and to explore how perceptions of blame and empathy may contribute to sentencing decisions. The primary hypotheses for the study were: (1) recommended sentence severity would vary as a function of TBI presentation (H1); (2) participants in the TBI information video conditions (either a personal narrative or a non-narrative story) would recommend less severe sentences than the TBI control condition where only information about the defendant's TBI was provided (H2), and (3) participants in the TBI personal narrative educational information condition would recommend less severe sentences than the TBI non-narrative educational information condition (H3).

8.4 Methods

8.4.1 Pre-Registration

This experiment was pre-registered on the OSF prior to any data collection (https://osf.io/dc8wt) and again included a summary of: (1) data exclusions; (2) power analysis calculations, and (3) interim and data termination points for sequential analysis.

8.4.1.1 Data Exclusions

The same exclusions were pre-registered as Experiment Two (see section 7.7.1.1) with the following adjustment to the completion time variable.

1. Completion time – participants who completed the study in less than 8 minutes, with the upper limit determined once descriptive data had been examined at each data checkpoint.

8.4.1.2 Power Analysis

To achieve 80% power for both contrasts for a one-way between subjects ANOVA, it was necessary specify power of .895 for each pairwise comparison (.895 x .895 = .80). Power analysis was conducted using the same ANOVA_exact Shiny app (http://shiny.ieis.tue.nl/anova_exact/: Lakens & Caldwell, 2019) used for Experiments One and Two, which can support factorial designs. This study replicated two of the same conditions as Experiment Two, so inputs (means and standard deviations) for the power analysis were taken directly from the results of the *TBI-education* (*M*= 2.77, *SD* = 1.17) and *TBI-no-education* (*M*= 3.14, *SD* = 1.23) conditions from Experiment Two for the 'sentencing severity' DV. These conditions, and thus inputs corresponded to the *TBI-depersonalised-education* and *TBI-control* conditions for this study, respectively. For power analysis, the full Cohen's *d* = 0.308237 value was taken from Experiment Two. The third mean input for the new *TBI-personalised-education* condition was estimated using the mean difference and pooled standard deviation for the other two conditions and was thus inputted as *M*= 2.40, *SD* = 1.20 to reflect the same Cohen's *d* value (~d = 0.3). As each pairwise comparison had a predicted direction of effect, one- tailed hypothesis tests were specified. A Bonferroni correction was then applied as two pairwise contrasts were planned, reducing the alpha level to .025 (.05/2). This analysis produced a required sample size of 219 per condition, resulting in a total sample size of 657 participants. To allow for data exclusions, the aim was to recruit approximately 788 participants. For a full step-by-step guide to these power analysis calculations, please see the pre-registration document (https:// osf.io/dc8wt).

8.4.1.3 Sequential Analysis

Sequential analysis was again used (see Lakens, 2014) and two interim data checkpoints were pre-registered: (1) when 50% of the data collection is complete (n = 329 after exclusions, with at least 110 participants in each condition) and (2) when 75% of the data collection is complete (n = 493 after exclusions, with at least 165 participants in each condition). Adjusted *p*-values were calculated using the

GroupSeq package for R following the method detailed in the pre-registration (https://osf.io/qtufw/). The resultant adjusted *p* values were: Checkpoint 1 (n = 329) - $p < .0125$ (50% data collection); Checkpoint 2 (n =493) - $p < .0104$; Full sample (n = 657) - $p < .012$.

Stopping rules were applied to the two interim 'peeking' points, and also included an additional stopping rule to the two previously applied in Experiments One and Two: (1) *Both* pairwise comparisons are statistically significant; (2) The effect sizes for *both* pairwise comparisons are smaller than Cohen's $d = .10$, in which case data collection would be terminated for futility; or (3) One contrast is futile (less than $d = .10$) and the other is significant to the adjusted critical *p*-value ($p < .0125$ at time 1, $p < .0104$ at time 2).

8.4.2 Participants

The recruitment and advertising strategy followed the same protocol as described for the first magistrates' study (see Chapter 6, section 6.19.1). In this experiment, data collection terminated once the final target sample size was met (N= 657, minimum of 219 participants per condition), as confirmatory analysis conducted at each of the interim checkpoints revealed that the aforementioned stopping rules were not met (see Appendix EE for results at each of these checkpoints). This resulted in a total sample of 834 'mock' legal decision makers, who were drawn from the general population, prior to exclusions. Following the exclusion criteria outlined above, 139 participants were excluded for the following reasons: (1) IP address duplicates (n= 4); (2) English

Language proficiency ratings (n = 7); (3) Video attentional fails (n = 61); (4) Video quality (n = 8); (5) Three scenario attentional control check fails (n =1); (6) Two scenario and one video fail (n = 14); (7) Failed more than one of these listed (exclusions 1 – 8) data exclusions (n= 25), and (8) Timing data (n = 19). For the completion time variable, data was visually inspected (using QQ plots and frequency charts) for a natural breakpoint which was 1hr.15 minutes 23 seconds here, and after this timepoint, participants were excluded. In addition to these pre-registered exclusion criteria, two additional participants were excluded because their reported age did not meet the inclusion criteria (18 +). A final sample of 693 participants were included in the confirmatory analysis. Participants' ages ranged from 18 to 79 years (*M* = 28.76, *SD* = 11.13), and 513 participants (74%) were female. For further demographic information, see Table 8.1.

Table 8.1

Summary of Demographic Characteristics

Demographic characteristics	**Sample (N= 693)**	
	n	**%**
Gender		
Male	170	24.5%
Female	513	74.0%
Prefer not to say	2	0.3%
Other gender identity	8	1.2%
Ethnicity		

White	493	71.1%
Multiple ethnic groups	21	3.0%
Asian	48	6.9%
Black	65	9.4%
Latino/Hispanic	5	0.7%
Middle Eastern	5	0.7%
White Sephardic Jew	1	0.1%
African	40	5.8%
Other ethnic group	10	1.4%
Other or prefer not to say	5	0.7%
Educational attainment		
No formal education	1	0.1%
Secondary School	72	10.4%
Sixth form/ college	220	31.7%
First degree	278	40.1%
Master's degree	91	13.1%
PhD/ Doctorate	18	2.6%
Other	13	1.9%
Employment status		
Full time employment	187	27.0%
Part-time employment	108	15.6%
Retired	12	1.7%

Unpaid carer	16	2.3%
Not working due to disability/health reasons	14	2.0%
Actively seeking employment	50	7.2%
Volunteer	2	0.3%
Full time student	298	43.0%
Part-time student	6	0.9%
Country of residence		
Australia/ New Zealand	27	3.8
Canada	12	1.7
Czech Republic	2	0.3%
France	4	0.5%
Germany	3	0.4%
Ireland	18	2.6%
Italy	5	0.7%
Poland	5	0.7%
Portugal	3	0.4%
Spain	5	0.7%
South Africa	105	15.1%
United Kingdom	450	64.8%
USA	24	3.5%
Other	32	4.8%

8.4.3 Design

To test the hypothesis that varied TBI Presentation would lead to a difference in sentencing severity ratings, a one-way between subjects' design was used. The independent variable (IV) was TBI Presentation which had three levels: (1) *TBI-personalised-education* (i.e., personal narrative)*;* (2) *TBI-depersonalised-education* (i.e., non-narrative), and (3) *TBI-control* (i.e., absence of TBI educational information). The central dependent variable (DV) was the 'Sentencing Severity' variable presented pre-verdict. Two contrasts were also planned to compare: (1) *TBI-depersonalised-education* and *TBI-personalised-education* vs *TBI-control,* and (2) *TBI-depersonalised-education* vs *TBI-personalised-education.* Additional dependent variables included the same measures included in Experiments One and Two, plus Blame Attributions, Empathy towards the defendant, and one further standardised measure of trait empathy - the Questionnaire of Cognitive and Affective Empathy (QCAE: Reniers et al., 2011).

8.4.4 Materials

8.4.4.1 Fictional Magistrates' Sentencing Remarks

The fictional case materials presented in this experiment are identical to the materials previously described for Experiment Two (see Chapter 7, section 7.8.4.1). However, in all conditions, the defendant was presented with a history of TBI (see Appendix R). Two of these conditions, *TBI-depersonalised-education,* and *TBI-control*, replicated the same two experimental conditions and video materials used in Experiment Two for *TBI- education* and *TBI-no-education*. Thus, for the *TBI-depersonalised-education* condition, a non-narrative video about brain injury, published by the Disabilities Trust was presented. For the *TBI-no-education* condition, a 'filler' video explaining what happens when a person goes to a magistrates' court, published by HM Courts and Tribunal Service, was presented. See Chapter 7, sections 7.8.4.1 and 7.8.4.2. for a full description of these videos.

8.4.4.2 Educational Materials: Personal Narrative of TBI

In addition to the two videos included in Experiment Two, an additional video containing a personal narrative about TBI was presented to participants in the *TBI-personalised-education* condition. To match the style and content of the experimental video used in Experiment Two, the personal narrative was narrated and included animated images throughout. This animated video clip (3 minutes and 55 seconds in length) was published by The Brain Injury Law Firm and depicted a survivor's lived experience of TBI. Described as an 'invisible raincloud,' a personal account of the ongoing and hidden effects of TBI are recounted (see Figures 8.1 and 8.2 below for examples images).

[redacted]

8.4.4.3 Sentencing Severity, Appropriateness of Sentencing, Consideration of Factors and Sentencing Options

The same three measures of Sentencing Severity, Appropriateness of Sentencing, and

Consideration of Factors were included as in Experiment Two (see Chapter 7). However, an amended Sentencing Options variable was included here, in which participants selected one category from the following four options: (1) A low-level community order (ranging from 40 hours – 300); (2) A suspended custodial (prison) sentence of up to 26 weeks (the sentence will only be served if the defendant violates the conditions of the suspension during the suspended period, which ranges from 6-24 months); (3) A custodial (prison) sentence of up to 26 weeks; and (4) Referral to the Crown Court for consideration beyond 26 weeks (up to a maximum of 51 weeks).Following this response, participants indicated their preferred length of sentence by selecting one of a possible 13 categories related to their chosen sentencing option, worded appropriately to the sentencing option chosen (see Table 8.2).

Table 8.2

Sentencing Options and Sentencing Length Follow Up Categories

Sentencing Option	**Sentencing Range**	**Sentencing Length Option – increments**	**Number of categories**	**Example Response 1**	**Example Response 2**
Community Order	40 – 300 hours	20 hours increments	13	Scale point 1: 40- 60 hours	Scale Point 2: 61- 80 hours
Suspended Custodial Sentence	Up to 26 weeks suspended sentence	2-week increments	13	Scale point 14: Up to 2 weeks suspended sentence	Scale point 16: 4- 6 weeks suspended sentence
Custodial Sentence	Up to 26 weeks custodial sentence	2-week increments	13	Scale point 30: 6-8 weeks custodial sentence	Scale point 33: 14-16 weeks custodial sentence
Referral to Crown Court for Sentencing	27 – 51 weeks custodial sentence	2-week increments (category 13 = 1 week increment)	13	Scale point 40: 26-28 weeks custodial sentence	Scale point 51: 48-50 weeks custodial sentence

This resulted in 52 categories of increasing severity. For the purpose of data analysis, this information was coded as one continuous variable, which could range from 1 to 52 (see Appendix FF).

8.4.4.4 Additional Questions

This experiment replicated the same questions and measures included in Experiment One which were presented to all participants: (1) An open-ended question asking participants what information they considered when reaching their decision; (2) Perceived Dangerousness questions (5-items) – the internal consistency of these items was excellent (α= .80); and (3) TBI questions (5-items). In addition, two further sets of questions were asked pertaining to blame attributions and empathy towards the defendant (see sections 8.2.4.4, and 8.2.4.5 below).

8.4.4.5 Blame Attributions

Participants rated their agreement (1 = Strongly Disagree to 7= Strongly Agree) with six questions which evaluated how participants attributed the defendant's blame and responsibility for the crime. Questions were adapted from the Gudjonsson Blame Inventory-Revised (Gudjonsson & Singh, 1989) and included the following items: (1) *The defendant is entirely to blame for this crime*; (2) *The defendant is responsible for this criminal act*; (3) *The defendant should not be punished for the criminal act they committed*; (4) *At the time of the crime, the defendant was fully aware of what he was doing;* (5) *The defendant was fully in control of their actions*, and (6) *What the* *defendant did was beyond their control*. Total scores (6-42) were calculated by summing the scores of individual items, with items three and six reverse scored prior. Higher scores indicated that participants attributed more blame towards the defendant. Cronbach's α was used to assess the internal consistency of these six items; with 'good' levels of internal consistency (α= .78) found.

8.4.4.6 State Empathy Towards the Defendants

Participants rated their agreement (1 = Strongly Disagree to 7= Strongly Agree) to five questions developed for this Experiment which evaluated the participant's state levels of empathy towards the defendant. The following items were included: (1) *I feel sorry for the defendant*; (2) *I feel very sympathetic towards the defendant*; (3*) I feel I understand why the defendant acted in that way*; (4) *I pity the defendant,* and (5) *I can empathise with the defendant's actions*. Individual scores were summed to create a total empathy score (5-35), whereby high scores indicate higher levels of empathy towards the defendant. Cronbach's α was used to assess the internal consistency of these five items; overall, the five items had 'excellent' internal consistency (α= .84).

8.4.4.7 Measures

In addition to PBIM36, BIAS20, LOC, JBS (see Chapters 3, 5 and 6), the QCAE was also used (described below).

8.4.4.8 The Questionnaire of Cognitive and Affective Empathy (Reniers et al., 2011)

The Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011) is a 31-item measure of *trait* cognitive and affective empathy. 27 items are worded to reflect good levels of empathy (e.g., *Before I do something I try to consider how my friends will react to it*) and four are worded to reflect poor levels of empathy (e.g., *I usually stay emotionally detached when watching a film*). All items are scored on a scale of 1-4 where 1 = strongly disagree, 2 = slightly disagree, 3 = slightly agree, and 4 = strongly agree. The 31-items are first summed to create five subscale scores, two reflecting cognitive subscales, and three reflecting affective empathy subscales. Subscales are then summed to first create one larger cognitive and empathy subscale, before combining those subscales to create an overall composite score. Total scores range between 31-124, with higher scores reflecting a higher level of empathy. (31-124) Total scores were used for the purpose of this Experiment.

8.4.4.9 Attentional Control Check Questions and Technical Quality Items

The same scenario-based attentional control check questions, video attentional control checks (for the ‘filler’ video and de-personalised education video), and video technical quality questions used in Experiments 1 and 2 were included here (see Chapter 6 and 7, sections 6.6.13 and 7.7.4.4). Due to the inclusion of a new video in the *TBI- personalised-education* condition, two new video attentional control check items were developed. These were: (1) *What are the main two colours used in the* *video animation?* (2) What *weather was NOT seen in the video?*

8.4.5 Procedure

Ethical approval was granted by Swansea University, Department of (now 'School') Psychology Research Ethics Committee (reference: 5028 see Appendix GG). The same procedures were followed as described for Experiments 1 and 2. After the fictional case was presented to participants, block randomisation was again used to assign participants to an experimental condition and to counterbalance the order of the Mitigating and Aggravating factors (e.g., aggravating first, or mitigating first). After the summary of the Mitigating and Aggravating factors, participants were either presented with the TBI- personalised video (*TBI-personalised -education* condition only), the TBI- depersonalised video (*TBI-depersonalised-education* condition only), or the magistrates' filler video (*TBI-control* condition).

Following the same procedure outlined for Experiment Two, the sentencing options were then presented, after which participants rated the severity of sentence they would recommend (pre-verdict decision), after which participants selected their preferred sentencing option. After this point, the procedure diverged from the previous studies to reduce the possible biasing effect of the magistrates' own sentencing verdict on participants ratings. As such the following set of questions were presented in randomised order to all participants, but *before* the magistrates' verdict was presented: a set of six blame Questions, a set of five Perceived Dangerousness questions, a set of five Empathy questions, and the set of five Perceptions of the Defendants TBI questions. The order of items within each set of questions was randomised. After rating each of these sets of questions, participants were asked to rate how influential each of the aggravating and mitigating factors were in this case. This was then followed by the magistrates' own sentencing verdict, after which participants rated the appropriateness of this verdict, and then again selected their preferred sentencing option. The attentional control checks, and technical quality questions were then presented. Finally, participants completed the PBIM36, BIAS20, LOC, QCAE and JBS in a random order. With the exception of the LOC, the presentation order of items contained within each were also randomised. The debrief process was consistent with Experiment Two.

8.4.6 Statistical Analysis

Most statistical analysis procedures follow those of Experiment One and Two (see sections 6.17.7 and 7.8.6). An ANOVA was conducted with two planned pairwise contrasts to test the central hypothesis, again using an adjusted alpha value ($p < .012$) to determine significance (see section 7.8.1.3.). The first hypothesis stated that educational materials about TBI, irrespective of type, would lead to lower sentencing severity recommendations compared to the control condition. Thus, the first planned contrast compared both educational conditions to the control condition and were weighted as +1 (*TBI-depersonalised-education*), + 1 (*TBI-personalised-education*) and -2 (*TBI-control*) to the control condition. The second hypothesis required a comparison between the two different types of educational materials and thus the contrast was weighted as -1 (*TBI- depersonalised-education*), + 1 (*TBI-personalised-education*) and the *TBI-control* was weighted as 0 so it was excluded from the analysis.

Throughout, parametric tests were performed, and assumption checks were conducted prior to statistical analysis using the same procedures outlined previously (see Chapter 6, section 6.17.7). However, as simulation research shows that ANOVA is robust against violations of normality (Schmider et al., 2010), no adjustment was made when a violation to this assumption occurred. In addition to this approach for assumption checks, p-values were Bonferroni corrected (.05/ number of conditions) to control for the family error rate (FWER) when a family of tests were required. Adjusted alpha values are reported throughout where applicable.

Further to the statistical analysis procedures carried out in Experiments One and Two, this Chapter also included Mediation Analysis to determine whether state levels of empathy and blame attributions explained any effects of education on sentencing severity ratings. Mediation analysis was conducted using Process v4.1 for SPSS (Hayes, 2022). The TBI-presentation variable was dummy coded in two separate variables. First, the TBI-control served as the reference category (TBI-control = 0), so the *TBI- depersonalised-education* and *TBI-personalised-education* conditions could be compared to the TBI-control condition. Second, the *TBI-personalised-education* served as the reference category (TBI-personalised-education = 0), so that it could be compared to the *TBI-depersonalised-education* condition. For each mediation analysis, 10,000 bootstrapped samples were used.

8.5 Results

8.5.1. Phase One of Data Analysis: Confirmatory Analysis

Descriptive statistics for each condition for the central dependent 'Sentencing Severity' variable are presented in Table 8.3

Table 8.3

Descriptive Statistics for the 'Sentencing Severity' Central Dependent Variable (Pre-Verdict)

TBI presentation	***M***	***SD***	**N (693)**
TBI-control	3.06	1.18	226
TBI-depersonalised	2.80	1.20	234
TBI-personalised	2.81	1.19	233

To test the central hypotheses, a one-way between subject ANOVA was conducted with two planned contrasts: (1) *TBI-depersonalised-education* and *TBI-personalised-education* versus *TBI-control*), and (2) *TBI-depersonalised-education* versus *TBI-personalised-education*. A statistically significant effect of TBI Presentation on 'Sentencing Severity' recommendations was found, $F(2, 690) = 3.61$, $p = .028$, $\eta p^2 = .01$. The inclusion of educational materials (i.e., combined *TBI-depersonalised- education* and *TBI-personalised-education* conditions) led to significantly lower sentencing severity recommendations for a defendant with TBI compared to when no additional educational materials (i.e., the *TBI-control*) were presented. This supports the first hypothesis that educational materials, irrespective of type, would lead to significantly lower sentencing severity recommendations compared to an absence of educational materials. However, no significant difference was found between the *TBI- depersonalised-education* condition and *TBI-personalised-education* condition (p>.012). Therefore, the second hypothesis that a personal narrative about TBI would lead to lower sentencing severity recommendation than non-narrative information was not supported (see Table 8.4).

Table 8.4

p-values and Cohen's d Values for Planned Contrasts

Pairwise contrast	***p*-value (one-tailed)**	**Cohen's *d* (95% CI)**
TBI-depersonalised and TBI-personalised vs TBI-control	.004	-.44 (CI-.75 to -.12)
TBI-depersonalised vs TBI-personalised	.472	.01 (CI- 19 to .18)

8.5.2. Phase Two of Data Analysis: Exploratory Analysis (Part One)

Similar to Experiments One and Two, exploratory analysis was conducted in two parts. The first part focused on analyses that would facilitate interpretation of the confirmatory hypothesis tests.

8.5.3. Consideration of Factors

A series of one-way ANOVAs (adjusted $p < .007$, .05/7) were conducted to evaluate how influential participants rated each of the aggravating and mitigating factors by TBI presentation condition (see Table 8.3). For three items, Levene's test revealed that the homogeneity of variance assumption was violated ($p < .05$) and therefore, Welch's F was instead used for these items (see Table 8.5). In contrast to Experiment Two, no significant effect of TBI Presentation was found.

Table 8.5

Descriptive Statistics and ANOVA Tests for each Aggravating and Mitigating Factor Revealing How Influential these were in Determining Sentencing Recommendation across TBI Presentation Conditions

	TBI-control (n= 226)	**TBI-depersonalised-education (n = 234)**	**TBI-personalised-education (n = 233)**	**One-way ANOVA**		
	M (SD)	*M (SD)*	*M (SD)*	*F* (2, 690)	*p*-value	ηp^2
Aggravating factors						
Punched victim 3 times	3.73 (1.08)	3.50 (1.08)	3.64 (1.07)	2.68	.070	.008
Unprovoked attack	3.69 (1.02)	3.55 (1.15)	3.70 (1.04)	1.39[a]	.251	-
Caused significant harm	3.95 (0.87)	3.75 (1.05)	3.82 (0.96)	2.55[b]	.079	-
Mitigating factors						
First offence	3.75 (1.03)	3.92 (0.91)	3.81 (1.01)	1.90[c]	.150	-
Culpability low for offence	3.47 (1.06)	3.59 (1.05)	3.53 (1.04)	0.65	.520	.002
Pleaded guilty	3.78 (1.06)	3.81 (0.99)	3.84 (1.04)	0.21	.809	.001
TBI mitigating factor	3.95 (1.06)	4.08 (0.97)	4.23 (0.91)	4.55	.011	.013

Note: [a]Welch's *F* adjusted *df*= 2, 459.34, [b]Welch's *F* adjusted *df*= 2, 458.63, [c]Welch's *F* adjusted *df*= 2, 457.50

8.5.4. Appropriateness of Sentencing

The same 'Appropriateness of Sentencing' dependent variable was presented to participants as in Experiments One and Two, but only at one decision timepoint, which was immediately after the magistrates' own sentencing verdict. Means and standard deviations were calculated for the *TBI-personalised-education* (*M* =4.01, *SD* = 0.86), *TBI-depersonalised-education* (*M* = 4.05, *SD* = 0.93) and *TBI-control* (*M* = 4.02, *SD* = 0.93). Overall, no significant main effect of TBI Presentation was found, $F(2, 690) = 0.12$, $p = .885$, $\eta p^2 < .001$. This finding replicates the findings across Experiments One and Two, whereby appropriateness of sentencing ratings were similar irrespective of TBI Presentation condition, with participants indicating agreement with the magistrates' sentencing verdict.

8.5.5. Sentencing Options Across Two Decision Timepoints (Before and After Magistrates' Sentencing Verdict)

The next set of analyses explore how TBI Presentation is associated with the sentencing options selected by participants, and to further assess if any change in sentencing options occurred before (pre-verdict) and after the magistrates' own sentencing verdict (post-verdict). The number and percentage of participants opting for each of the four sentencing categories for each TBI condition is presented in Table 8.6.

Table 8.6

Descriptive Statistics of Sentencing Option Pre-Verdict and Post-Verdict

Sentencing Option	**Sentencing option – pre-verdict**			**Sentencing option – post-verdict**		
	TBI-control (n= 226)	TBI-depersonalised-education (n=234)	TBI-personalised-education (n=233)	TBI-control (n= 226)	TBI-depersonalised-education (n=234)	TBI-personalised-education (n=233)
Community order n (%)	95 (42.0%)	117 (50.0%)	110 (47.2%)	70 (30.97%)	89 (38.03%)	81 (34.76%)
Suspended Sentence n (%)	110 (48.7%)	103 (44.0%)	108 (46.4%)	134 (59.29%)	131 (55.98%)	139(59.65%)
Custodial Sentence n (%)	17 (7.5%)	11 (4.7%)	12 (5.2%)	17 (7.52%)	12 (5.13%)	12 (5.15%)
Crown Court n (%)	4 (1.8%)	3 (1.3%)	3 (1.3%)	5 (2.21%)	2 (0.85%)	1 (0.43%)

First, A chi-square test of independence was performed to investigate if any shift in sentencing option before and after the presentation of the magistrate's sentencing verdict was associated with TBI Presentation condition. To do this, two new 'Shift in sentence' categorical (change vs no change) variables were computed to compare sentencing options selected between before and after the magistrate's sentencing verdict. A 2 (Shift in sentence: no change vs change) x 3 (TBI Presentation: *TBI-personalised-education*, *TBI-depersonalised-education*, and *TBI-control*) chi-square test of independence found no significant association between TBI Presentation and sentence shift from pre-verdict to post-verdict ($X^2(2) = 0.83$, p=.662. Therefore, TBI was not associated with any shift in sentencing recommendations before and after the magistrates' sentencing verdict was presented.

Second, the effect of TBI Presentation and sentencing timepoint on a computed sentencing variable which ranged from 1 (lenient sentence) to 52 (harsh sentence; see section 8.2.4.2) was investigated. To do this, a two-way mixed subjects ANOVA was conducted to assess the effect of TBI Presentation (between subjects' independent variable with three levels: *TBI-personalised- education, TBI-depersonalised-education,* and *TBI-control)* and decision timepoint (within subjects' independent variable with two levels: *pre-verdict* and *post-verdict*) on sentencing scores. No significant main effect of TBI Presentation on sentencing scores was found, $F(2, 690) = 1.51$, p=.222, ηp^2=.004, whereas a significant main effect of sentencing timepoint was found, $F(1, 690) = 59.65$, $p<.001$, ηp^2=.01. Sentencing scores were significantly higher post-verdict (*EMM*= 16.84, *SE* = 0.38) than pre-verdict (*EMM*= 15.03, *SE* = 0.38), indicating that participants selected a more severe sentence after they had read the magistrates' sentencing verdict. However, this shift in direction represented only a small change in sentencing option - moving from a 2-

4 week suspended sentence (scale point 16) to a 4-6 week suspended sentence (scale point 16). Furthermore, this shift moved in the direction of greater agreement with the magistrates' own sentencing verdict of 13 weeks suspended custodial sentence. No significant interaction was found between TBI Presentation and sentencing scores, $F(2, 690)= 1.20$, $p<.001$, $\eta p^2 = 0003$. Therefore, and consistent with the same pattern of findings observed across Experiments 1 and 2, the sentencing options participants selected did not differ according to TBI Presentation, although participants were more likely to opt for a slightly harsher sentence after they had read the magistrates' verdict, but which moved closer to the magistrates' own sentencing verdict.

8.5.6. Perceptions of the Defendant's Brain Injury

Participants were asked five questions pertaining to their perceptions of the defendants' brain injury (see Table 8.7). One kurtosis statistic violated the assumption of normality (item 5 - *TBI-personalised-condition)*, but all remaining Skewness and Kurtosis scores were within acceptable parameters. Furthermore, Levene's test of equality of variance was significant for items four and five, meaning that the assumption of homogeneity was violated. Welch's *F* is therefore reported for these items. A series of one-way ANOVAs (adjusted $p<.01$) were conducted to evaluate if perceptions of brain injury varied according to TBI Presentation and significant differences were found across four of the five items (see Table 8.7).

Table 8.7

Descriptive Statistics for Perceptions of the Defendants TBI Questions for TBI Presentation Conditions

Perceptions of defendants TBI	TBI personalised education	TBI de-personalised education	TBI Control	One-way ANOVA		
	M (SD)	*M (SD)*	*M (SD)*	*F*(2, 690)	*p*-value	ηp^2
1. The defendant has made a good recovery	3.83 (1.14)	3.80 (1.15)	3.95 (1.11)	1.12	.328	.003
2. The defendant's brain injury has had a big impact on their daily life.	5.66 (1.18)	5.08 (1.16)	5.03 (1.20)	20.39	<.001	.056
3. The defendant has sustained a severe brain injury.	5.50 (1.28)	5.16 (1.24)	5.20 (1.28)	5.13	.006	0.15
4. The defendant is going to make a full recovery in the future.	3.70 (1.36)	4.15 (1.01)	4.27 (1.16)	13.22	<.001[a]	-
5. The defendant is still experiencing ongoing issue as a result of their brain injury.	5.82 (0.96)	5.51 (1.05)	5.45 (1.15)	8.57	<.001[b]	-

Note: [a]Welch's *F* adjusted *df* = 2, 453.69, [b]Welch's *F* adjusted *df* = 2, 456.04.

Bonferroni corrected post hoc comparisons were conducted for items where a significant main effect was found. For items *'The defendant is still experiencing ongoing issue as a result of their brain injury,' 'The defendant has sustained a severe brain injury*' and '*The defendant's brain injury has had a big impact on their daily life*', the *TBI-personalised-education* condition had significantly higher scores (p<.05) compared to both the *TBI-depersonalised-education* and *TBI-control* conditions. The reverse pattern was found for item *'The defendant is going to make a full recovery in the future',* where the *TBI-personalised-education* condition had a significantly lower score (p<.05) compared to both the *TBI-depersonalised-*

education and *TBI-control* conditions. Furthermore, and replicating the findings in Experiment Two, no significant differences were found between the *TBI-depersonalised-education* and *TBI-control* conditions (p>.05). Thus, participants were more likely to perceive the defendant's brain injury as having a serious ongoing impact on daily life and perceived them as being less likely to make a full recovery, when a personal story was presented compared to either no educational information or a depersonalised story. In contrast, participants who received the depersonalised story rated items similarly to the control condition (no TBI).

8.5.7. Perceptions of the Defendant – Perceived Dangerousness

The next set of exploratory analysis examined if Perceived Dangerousness scores were impacted by TBI Presentation, Descriptive statistics are presented in Table 8.8.

Table 8.8

Descriptive Statistics for Perceived Dangerousness Total Scores for the TBI Presentation Conditions

Perceived Dangerousness Question	**TBI personalised education**	**TBI de-personalised education**	**TBI Control**
	M (SD)	*M (SD)*	*M (SD)*
Total score			
The defendant should be considered a danger to society	2.98 (1.42)	2.91 (1.47)	3.11 (1.34)
The defendant has a criminal personality	2.21 (1.16)	2.18 (1.15)	2.36 (1.08)
The defendant has a violent personality	2.99 (1.37)	3.10 (1.42)	3.38 (1.36)
The defendant is likely to re-offend	3.79 (1.28)	3.10 (3.65)	3.78 (1.27)
The defendant's behaviour is unpredictable	4.96 (1.19)	4.83 (1.34)	4.78 (1.29)

A one-way between subjects ANOVA showed that Perceived Dangerousness scores did not statistically differ by TBI Presentation F (2, 690) = 1.37, p = .256, ηp^2= .004. Thus, TBI Presentation had no effect on the perceived dangerousness of the defendant.

8.5.8. Blame Attributions

Blame attributions were evaluated to explore if levels of blame differed across the three TBI Presentation conditions. A one-way between subjects ANOVA was conducted and a significant effect of TBI Presentation on blame attribution scores was found, F(2, 260) = 20.38, p <.001, $\eta p^{2\,=}$ .056. Bonferroni corrected post hoc comparisons showed that TBI-control had significantly higher blame attribution scores (M = 28.68, SD = 5.38) compared to both *TBI-depersonalised-education* (M = 26.53, SD = 5.52) and *TBI-personalised-education* (M = 25.53, SD = 5.12) (p<.05), but no difference was found between *TBI-depersonalised-education* and *TBI-personalised-education* (p>.05). Therefore, and irrespective of the type of educational materials presented, educational information led to lower blame attributions compared to no educational information.

8.5.9. State Empathy Towards the Defendant

A one-way between subjects ANOVA was conducted to determine if state empathy scores differed across the TBI Presentation conditions. A significant main effect was found F(2, 260) = 32.65, p <.001, $\eta p^{2\,=}$ .086. Bonferroni corrected post hoc comparisons revealed significant differences for all three conditions, whereby *TBI-personalised-education* (M = *22*.74, SD = 5.25) had a significantly higher empathy score than both *TBI-depersonalised-education* (M = 20.85, SD= 5.71) and *TBI-*

control (*M* = 18.50, *SD* = 5.91), and the *TBI-depersonalised-education* had a significantly higher state empathy score compared to an absence of educational information (*TBI-control)*. In sum, the inclusion of educational materials led to higher state empathy ratings compared to the *TBI-control* condition. However, a personal narrative led to higher state empathy scores compared to a non-narrative story.

8.5.10. Mediation Analysis Using Blame Attribution and State Empathy Scores – Exploring Underlying Mechanisms Involved in Sentencing Decisions

As blame attributions and state levels of empathy towards the defendant varied according to TBI Presentation, a serial mediation model (see Figure 8.3) using Process (model 6; Hayes, 2013) was conducted to explore the direct and indirect effects of TBI Presentation (predictor variable – variable X) on Sentencing Severity ratings (outcome variable – variable Y). Two mediators were added in serial: State Empathy scores (M_1) and Blame Attribution scores (M_2). To determine significance, Hayes (2013) stipulates that confidence intervals (CI) must not cross 0. The model shows the possible direct and indirect pathways. For the direct pathway, mediation analysis assesses the effect of TBI Presentation (predictor variable - X) on Sentencing Severity (outcome variable - Y). For the indirect pathways, serial mediation analysis assesses the effect of TBI Presentation (predictor variable X) on Sentencing Severity (outcome variable Y) via three distinct pathways: (1) State Empathy and Blame Attributions ($X \longrightarrow M_1 \longrightarrow M_2 \longrightarrow Y$); (2) State Empathy ($X \longrightarrow M_1 \longrightarrow Y$), and (3) Blame Attributions ($X \longrightarrow M_2 \longrightarrow Y$).

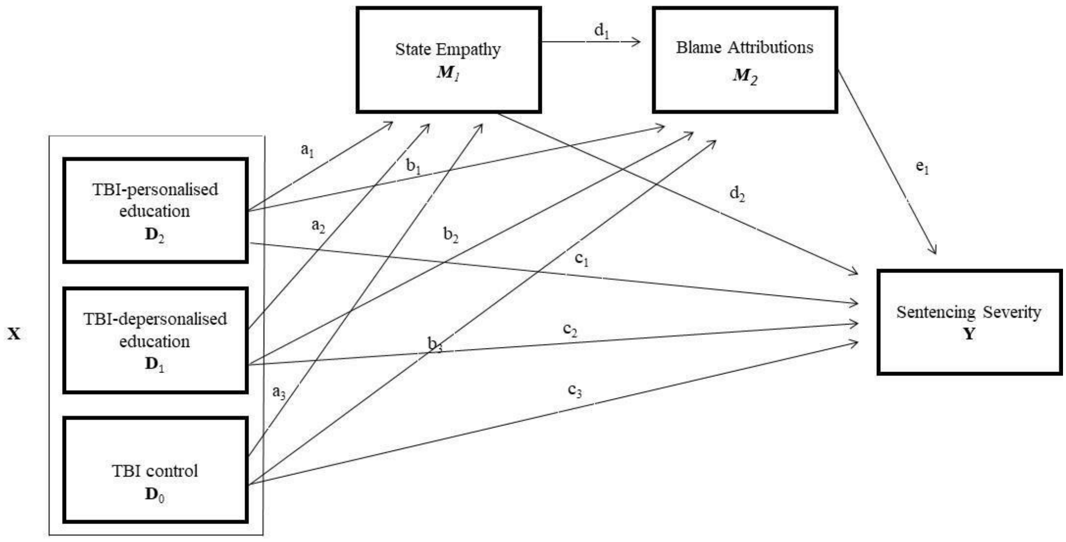

Figure 8.3 *Serial Mediation Model Showing the Direct and Indirect Effects between TBI Presentation and Sentencing Severity Recommendations Using State Empathy and Blame Attributions as Mediators*

Overall, the total effects model was significant (*p<.05*) meaning that TBI Presentation had a significant overall effect on Sentencing Severity ratings. The next step in the analysis was to assess whether this overall effect was direct (X —›Y) or whether it was indirect (i.e., mediated via Blame Attributions and/or State Empathy). This analysis revealed that the direct effect of TBI Presentation on sentencing severity was not statistically significant (*p>.05*). Rather, the effect of TBI Presentation condition on Sentencing Severity ratings was mediated via Blame Attributions and State Empathy along the following three specific pathways.

The first statistically significant mediation pathway was as follows: TBI Presentation —› State Empathy scores —› Blame Attribution scores—› Sentencing Severity ratings. The first step in the pathway was to assess the relationship between TBI Presentation and State Empathy (TBI Presentation —› State Empathy scores) which was significant. Higher State Empathy scores were found for *TBI-personalised- education* condition (a_1), *B* = 4.24, *CI* = 5.27 to 3.21, and *TBI-*

depersonalised-education condition (a_2), *B*= 2.35, *CI* = 1.32 to 3.38 compared to *TBI-control*. State Empathy scores were lower in the *TBI-depersonalised-education* condition, *B* = -1.89, *CI* = -2.91 to – 0.87 when contrasted to the *TBI-personalised-education* condition. The second step in the pathway was to assess the relationship between State Empathy and Blame Attribution, and State Empathy was found to be negatively related to Blame Attributions scores ($d_{1;}$; $p<.05$), *B* = -.49, *CI* = -.55 to -.43. Higher levels of State Empathy led to lower levels of Blame Attributions. The third step in this pathway assessed the relationship between Blame Attributions and Sentencing Severity ratings, which were found to be significantly positively related to Sentencing Severity ratings ($e_{1;}$ $p<.05$), *B* = .05, *CI* = .03 to .07. Thus, higher levels of blame were associated with higher sentencing severity ratings. For the overall indirect pathway (TBI Presentation —› State Empathy scores —› Blame Attribution scores—› Sentencing Severity ratings), lower sentencing severity ratings were found for the *TBI-personalised- education condition* (a_1, d_1, e_1), *B*= -.10, *CI* = -.16- to -.06, and *TBI-depersonalised-education condition* (a_2, d_1, e_1), *B* = .06, *CI* = -.10 to -.02, than the *TBI-control* condition when mediated through this pathway. Furthermore, a specific indirect effect was also found so that harsher Sentencing Severity ratings were given in the *TBI-depersonalised-education* condition when it was contrasted to the *TBI-personalised-education* condition (a_2, d_1, e_1), *B* = .04, *CI* =.02 to .08 when mediated via this indirect pathway.

The second statistically significant mediation pathway was as follows - TBI Presentation —› State Empathy scores —› Sentencing Severity ratings. Replicating the same pattern of findings observed for the first mediation pathway, a significant indirect effect of TBI Presentation on Sentencing Severity ratings was found ($p<.05$). The first step in this pathway has been previously reported (TBI Presentation —› State Empathy scores – see above). The second step, which assessed the relationship between State Empathy scores and Sentencing Severity ratings (State Empathy scores —› Sentencing Severity ratings) showed that lower levels of State Empathy was associated with higher Sentencing Severity ratings ($d_{2;}$; p<.05), B = -.04, CI = -.05 to -.02. For the overall indirect pathway (TBI Presentation —› State Empathy scores —› Sentencing Severity ratings) lower Sentencing Severity ratings were found for both *TBI-personalised-education*, (a_1, d_2), B = - .16, CI -.25 to -.08 and *TBI-depersonalised-education*, (a_2, d_2), B = -0.09, CI = - .15 to -.04 when contrasted to the *TBI-control* condition. A specific indirect effect showed that higher Sentencing Severity ratings were given in the *TBI-depersonalised-education* (a_2, d_2), B = .07, CI = .03 to .13, when contrasted to *TBI-personalised-education*.

Overall, these two pathways show that educational information leads to lower Sentencing Severity ratings compared to an absence of educational information when the relationship was mediated via: (1) State Empathy followed by Blame Attributions (X —› M_1 —› M_2 —›Y) and (2) State Empathy (X —› M_1—› Y) alone. Furthermore, for both these pathways a personal narrative (i.e., *TBI-personalised-education*) leads to lower Sentencing Severity ratings when compared with non-narrative (i.e., *TBI-depersonalised-education*) educational materials.

The third statistically significant mediation pathway was as follows: TBI Presentation —› Blame Attributions —› Sentencing Severity ratings. The first step in the pathway assesses the relationship between TBI Presentation and Blame Attributions. Lower Blame Attribution scores were found for *TBI-personalised-education* condition (a_1), B = -1.07, CI = -0.18 to -1.96, and *TBI-depersonalised-education* condition (a_2), B= -1.00, CI = -1.86 to -0.14 compared to *TBI-control*. However, no significant effect was found when Blame Attribution scores in the *TBI-depersonalised-education* condition, B = -0.8, CI = 0.93 to -0.78 was contrasted to the *TBI-personalised-education* condition. The second step in the pathway (Blame

Attributions —› Sentencing Severity) ratings has been previously reported (see above). Overall, an indirect effect for this pathway (TBI Presentation —› Blame Attributions —› Sentencing Severity ratings) was found for TBI Presentation on Sentencing Severity ratings for both *TBI-personalised-education* (b_1, e_1), *B* = - .05, *CI* -.11 to -.01 and *TBI-depersonalised-education*, (b_2, e_1), *B* = -0.05, *CI* = - .10 to -.01) when contrasted to the *TBI-control* condition. In contrast to the previous pathways, no significant indirect was found when *TBI-depersonalised-education*, *B*=.003, *CI* = -.04 to .05 was contrasted with the *TBI-personalised-education* condition. Although this pathway showed that educational materials lowered Sentencing Severity ratings when compared to an absence of educational materials, both types of educational materials had a similar indirect effect on Blame Attributions and subsequently on Sentencing Severity ratings.

8.5.11. Phase Three of Data Analysis: Exploratory Analysis (Part Two) with LOC, JBS, PBIM36, BIAS20 and QCAE Measures

Secondary exploratory analyses were carried out to evaluate if factors such as familiarity/proximity (LOC), trait levels of empathy, and legal opinions contributed to sentence severity ratings. The relationship between sentence severity ratings and knowledge (PBIM26) and attitude (BIAS20) scores were also explored. Following the data quality protocol outlined in the pre-registration document, participants (n=39) were excluded if they failed one or more of the five attentional control check questions embedded in the PBIM36 (three checks) or BIAS20 (two checks). Therefore, this analysis is based on a sub-set of n= 654 participants (n = 218 for *TBI-personalised- education*, n = 223 for *TBI-depersonalised-education*, and n = 213 for *TBI-control*). See Appendix HH for the demographics for this sub-set of participants.

8.5.12. LOC and TBI Presentation

First, LOC scores were assessed to determine if levels of proximity to brain injury differed across TBI Presentation conditions. Similar to Experiments One and Two, the modal rank was 4 (‘*I have watched a documentary on the television and internet about brain injury’*) across all three TBI conditions. When LOC scores were categorised into ‘Low,’ ‘Medium’ and ‘High’, the majority of participants fell into the ‘Low’ category (see Table 8.7) across all TBI conditions. As expected, a chi-squared test of independence confirmed that there was no association between TBI Presentation and LOC Categories, X^2 (4) = 2.78, $p < .595$. Thus, it is unlikely that levels of proximity impacted the study’s original findings that education materials reduced sentencing severity ratings when a defendant was presented with a brain injury.

Table 8.9

Percentage of Participants in the LOC Categories for the TBI Presentation Conditions

LOC Category	TBI personalised education n (%)	TBI depersonalised education n (%)	TBI control n (%)
Low[a]	127 (58.3%)	140 (62.8%)	122 (57.3%)
Medium[b]	37 (17.0%)	31 (13.9%)	30 (14.1%)
High[c]	54 (24.8%_	52 (23.3%)	61 (28.6%)

[a]Low LOC category = ranks 1-4, [b]Medium LOC category = ranks 5- 8, [c]High LOC category = ranks 9-12.

8.5.13. The Effect of Legal Opinions and Trait Empathy on Sentencing Severity Ratings

The next set of analyses focused on exploring whether legal opinions (JBS) and trait levels of empathy (QCAE) influenced sentencing severity ratings across the three TBI Presentation conditions. Furthermore, these analyses aimed to evaluate if the addition of these variables impacted the study's central findings that educational materials about TBI led to lower sentencing severity ratings compared for a defendant with TBI when compared to an absence of educational materials. To do this, and replicating the same approach taken for confirmatory analysis, a series of ANCOVAs were initially conducted using both of these measures as covariates individually.

First, and replicating Experiment Two, a significant effect of TBI Presentation on sentencing severity was found when the JBS was included as a covariate, $F(2, 650) = 3.34$, $p = .036$, ηp2= .01. The covariate, JBS, also had a significant positive relationship with sentencing severity ratings, $F(1, 650) = 27.24$, $p<.001$, ηp2= .04, such that higher sentencing severity scores were related to higher pro-prosecution attitudes. Estimated marginal means (EMM) were significantly lower (p=.008 one-tailed) when *TBI-personalised-education* (*EMM* = 2.75, *SE* = .08) and *TBI-depersonalised-education* (*EMM* = 2.85, *SE* = .08) were compared to *TBI-control (EMM = 3.04, SE =* 0.08), replicating the same pattern of findings observed for the confirmatory analysis. No significant difference (p =.310, one-tailed) was found between *TBI-personalised- education* (*EMM* = 2.75, *SE* = .08) and *TBI-depersonalised-education* (*EMM* = 2.85, *SE* = .08). These findings mirror the study's original findings that irrespective of the type of educational materials, the addition of educational materials led to significantly lower sentencing severity ratings compared to no educational information. Furthermore, no effect of type of educational materials on sentencing severity ratings was observed.

Second, no significant effect of TBI Presentation on sentencing severity was found when QCAE were entered as a covariate, $F(2, 650)= 3.01$, p=.05, ηp2=.009. The covariate QCAE was also negatively associated with sentencing severity ratings, $F(1, 690) = 7.00$, p=.008, ηp2=.01, such that higher levels of empathy were associated with lower sentencing severity ratings. Thus, and contrasting the findings in Experiment Two, no significant effect of TBI Presentation on sentencing severity ratings was found after separately controlling QCAE total scores.

8.5.14. Combined effect of Legal Opinions and Trait Empathy on Sentencing Recommendations (Pre-Verdict Ratings)

An ANCOVA was next performed to determine the effect of the TBI Presentation conditions on the appropriateness of sentencing variable, whilst controlling for JBS and QCAE total scores together. A significant effect of TBI Presentation on sentencing severity was found, $F(2, 649) = 3.07$, p= .047, ηp2= .01. The JBS was significantly positively associated with sentencing severity ratings, $F(1, 649) = 23.31$, $p < .001$, $\eta p2 = .04$. The QCAE was significantly negatively associated with sentencing severity, $F(1, 649) = 6.13$, $p = .014$, $\eta p2 = .01$. That is, higher JBS scores and lower QCAE scores were related to higher sentencing severity scores. Mirroring prior findings, estimated marginal means (EMM) were significantly lower ($p = .009$, one-tailed) when *TBI-personalised-education* (*EMM* = 2.77, *SE* = .08) and *TBI-depersonalised-education* (*EMM* = 2.84, *SE* = .08) were compared to *TBI-control (EMM = 3.03, SE* = 0.08), replicating the same pattern of findings observed for the confirmatory analysis. No significant difference ($p = .87$, one-tailed) was found between *TBI-personalised- education* (*EMM* = 2.77, *SE* = .08) and *TBI-depersonalised-education* (*EMM* = 2.84, *SE* = .08).

8.5.1 Relationship between Sentencings Severity and Knowledge of, and Attitudes towards, Brain Injury

Following the same approach adopted in Chapter 7 (section 7.9.11), PBIM36 and BIAS20 scores were compared across the TBI Presentation conditions. One-way between subjects ANOVAs were conducted, and no significant differences were observed (see Table 8.10).

Table 8.10

PBIM36 and BIAS20 scores for TBI Presentation Conditions

Measure	**No-TBI (n = 213)**		**TBI de-personalised education (n = 223)**		**TBI personalised education (n= 218)**		***F* (2, 651)**	***p*-value**	**ηp^2**
	M	*SD*	*M*	*SD*	*M*	*SD*			
PBIM36 Total score	167.87	19.84	171.12	18.85	171.99	16.94	2.95	.053	.009
BIAS20 Total score	99.05	11.70	99.34	11.67	100.24	11.57	.62	.540	.002

Subsequently, Pearson's correlations (adjusted $p < .07$, .05/7) showed no significant relationships between PBIM36 (total and subscale) scores and sentencing severity ratings (see Table 8.11).

Table 8.11

Correlations between PBIM36 (Total and Subscales) and Sentencing Severity Ratings

			Pearson's correlations	
	M	**SD**	***r*(df = 652)**	***p*-value**
PBIM36 Total	169.73	19.40	-.09	.028
Signs and symptoms of brain Injury	61.23	8.75	-.07	.057
Social determinants and consequences of brain injury	16.87	3.96	-.05	.238
Severity and impact of brain Injury	29.64	4.71	-.01	.815
Insight	28.42	5.50	-.10	.012
Permanence of brain injury	12.89	3.10	.04	.310
Physical and medical expectations	20.69	4.58	-.08	.054

However, BIAS20 total, 'Genuineness' and 'Risk and dangerousness' subscale scores were significantly negatively related to sentencing severity ratings (adjusted $p < .01$, .05/5), such that more positive attitudes were related to lower sentencing recommendations. However, relationships were weak (< .3; see Table 8.12).

Table 8.12

Correlations between BIAS20 (Total and Subscales) and Sentencing Severity Ratings

			Pearson's correlations	
	M	**SD**	***r*(df = 652)**	***p*-value**
BIAS20 total	99.55	11.64	-.14	<.001
Social inclusion	32.86	5.65	.-.09	.024
Empathy	25.43	4.00	-.05	.219
Genuineness	19.29	3.66	-.13	.001
Risk and dangerousness	21.97	4.24	.11	.007

8.6 Discussion

Experiment Three aimed to examine the effects of providing two different types of educational information about TBI, either non-narrative (i.e., factually oriented information) or a personal narrative (i.e., lived experience), on sentencing severity ratings when defendants were presented with a history of TBI. To do this, two types of educational materials about TBI were presented to 'mock' legal decision makers who were drawn from the general population. The non-narrative video described the hidden and long-term effects of TBI, whereas the narrative video depicted a personal account of challenges faced by a survivor of a TBI. These conditions were compared to a control condition whereby a description of the defendant's TBI was presented as a mitigating factor. Supporting the first hypothesis, and replicating the findings observed in Experiment Two, supplementing the textual descriptions of TBI with educational videos, led to lower sentencing severity ratings. However, the second hypothesis was not supported, as both types (narrative and non-narrative) of educational materials led to similar sentencing severity ratings. Furthermore, and reflecting the findings reported previously (see Chapters 6 and 7), the presentation of the magistrates' verdict provided an anchor point to participants as no difference in sentencing recommendations was observed after this point. Following the same pattern of findings observed for Experiments One and Two, appropriateness ratings indicated general agreement to the magistrates' sentencing verdict, and consequently, eliminated the effect of educational materials on the decision.

In contrast to research reporting that personal narratives are better at communicating health messages compared to non-narrative information (e.g., Das et al., 2008; Murphy et al., 2013; 2015), sentencing recommendations did not differ as a function of type of education provided – narrative or non-narrative. This is consistent with De Iorio et al. (2017) who investigated attributions of brain injury in relation to an adolescent, finding that a personal narrative versus non-narrative information about brain injury had a similar effect on how participants attributed a change in behaviour (either to adolescence or TBI), albeit both being superior to an absence of educational information. However, a further key finding in this study showed that personal narratives were more effective in reducing the adolescent explanation of behaviour, and proportionally, the TBI explanation was more likely to be endorsed.

A further aim of this Experiment was to examine the possible underlying mechanisms mediating the relationship between educational information and sentencing recommendations. In Experiment Two (see Chapter 7), the perceived dangerousness of a defendant with a history of TBI did not differ when educational information was included, a finding that was replicated in this Experiment. Consequently, and on the basis of prior research (see Feigenson, 2016; J. L. Wood et al., 2014), further questions were included to explore whether different types of educational information altered blame attributions and state empathy levels. Furthermore, previous research has found that these constructs can impact on legal judgements and thus may be contributing to the sentencing decision (see Feigenson, 2016; J. L. Wood et al., 2014). Even so, blame attributions did not differ between narrative and non-narrative material in this experiment, although blame ratings were significantly lower in the education conditions compared to the TBI-control – where the latter evidenced the highest blame attribution scores. Thus, educational materials lowered perceptions of blame towards to the defendant compared to an absence of educational materials.

Arguably, however, personal narratives may elicit a stronger emotional response and create a stronger connection to the narrator in the story (e.g., Kreutzer et al., 2007). In line with this, the current Experiment showed that whilst educational materials increased state levels of empathy compared to an absence of educational materials, a personal narrative elicited the strongest emotional response. This increased empathy potentially led participants to feel more emotionally connected to the defendant. Indeed, the highest ratings of *state* empathy were observed for the personal narrative, and these were significantly higher when compared to non-narrative educational information. There is also further evidence to suggest that a personal narrative changed how the defendant was perceived by the decision maker. Specifically, the defendant's brain injury was considered more impactful, severe, and with poorer recovery potential after viewing the personal narrative (i.e., personalised information) compared to either the non- narrative (i.e., depersonalised information) educational materials or an absence of educational information. This finding contrasts to the non-narrative educational materials, whereby perceptions of brain injury were similar to an absence of educational information. Thus, whilst the personal narrative did not alter the sentencing recommendation compared to non-narrative educational information, it did impact on how empathetic the participant felt towards the defendant and how the participant viewed the defendant's brain injury.

Finally, and to explore whether state empathy and blame attributions were important mechanisms underpinning the relationship between educational information and sentencing recommendations, serial mediation analysis was conducted. First, whilst the model was significant, no direct effect of education on sentencing severity recommendations was shown. Instead, the relationship was mediated indirectly via state empathy and blame attributions. Second, narrative, and non-narrative educational information was found to lower sentencing recommendations compared to the control condition, which was mediated through eliciting a higher level of state empathy towards the defendant. This subsequently lowered how much blame participants apportioned to the defendant for their actions, which then consequently lowered sentencing recommendations. Third, the same pattern of findings was observed when blame attributions alone were included in the mediation analysis. Fourth, when state empathy was included in the mediations analysis, with and without blame attributions, a personal narrative led to lower sentencing severity ratings compared to non-narrative information. Thus, a personal narrative indirectly led to lower sentencing recommendations compared to non-narrative information by eliciting a greater level of state empathy towards the defendant. Aligning to prior findings showing that personal narratives are potentially more effective than non-narratives in communicating key information and messages (e.g., Das et al., 2008), the personal narrative used here potentially created a greater emotional connection to the defendant in the case materials, whereby the educational materials enabled the decision maker to be 'transported' into the lived experience of a person with TBI (see Green and Brock, 2000; Green et al., 2004; Kreutzer et al., 2007). Thus, personal narratives are key educational tools that are at least effective as non-narrative types of education, but also create a stronger empathic response to an individual with TBI.

Further, and replicating the findings from Experiment Two, a significant main effect of TBI Presentation on sentencing was still observed when legal opinions and trait levels of empathy were included as covariates. Further, stronger pro-prosecution attitudes were again related to harsher sentencing recommendations, and higher levels of trait empathy were also related to lower sentencing severity ratings. Higher total BIAS20, 'Genuineness' and 'Risk and dangerousness' subscale scores were also related to lower sentencing recommendations, but no significant associations were found between sentence severity ratings and PBIM total or subscale scores. As in Chapter 7, the latter finding likely reflects the multitude of factors that contribute to sentencing recommendations aside from knowledge and attitudes about brain injury. Indeed, in addition to trait levels of empathy and legal opinions, each of the core mitigating and aggravating factors were also rated at least moderately influential to the sentencing recommendations.

8.6.1 Limitations and Future Directions

In line with Experiment Two, the sequence of the experimental design limited how the PBIM36 and BIAS20 measures could be incorporated into data analysis. Whist no significant differences were observed on the measures across the TBI Presentation conditions, the possibility remained that the inclusion of educational materials about TBI could have influenced responses on these measures. Further, the findings of this study showed that the addition of educational materials did not alter the sentencing options selected. Therefore, whilst the amended sentencing option continuous variable was designed to be more sensitive, it still did not detect any significant differences between conditions. In Experiments One and Two, the same pattern of findings was observed, and it was considered that lack of sensitivity of the variable to detect changes may be responsible. Consequently, the variable was adapted here to increase the sensitivity to detect a change in sentencing decision. However, the inclusion of educational materials did not affect the sentencing option selected but did lead to a change in sentencing options across timepoints, such that the recommended sentencing option was harsher at the second compared to the first timepoint. This provides some evidence that the actions to improve the sensitivity of this variable had been beneficial. The finding that sentencing options were not impacted by TBI presentation across all three experiments contrasts with other research investigating perceptions of brain injury in relation to guilt and sentencing.

For instance, St Pierre and Parente (2018) found that a defendant with severe TBI was perceived as less punishable for their crimes, and a milder form of punishment (i.e., rehabilitation) was also favoured. Furthermore, a crime by TBI presentation interaction was found in their first study (St Pierre & Parente, 2016), whereby punishment and guilt ratings were lower for the severe TBI condition but only in the murder trial scenario. The second study also had a crime of voluntary manslaughter (St Pierre & Parente, 2018). Thus, it is also possible that the severity of crime may also be contributing to this difference in findings. In this Experiment, the crime of assault was chosen to reflect a trial suitable for a magistrates' court, and hence a more serious crime of murder would be beyond the scope of what could be included in magistrates' fictional case materials. Furthermore, in the current study the sentencing options choices did not include any questions about rehabilitation. However, it may be useful to consider this in future research given that magistrates' have sentencing powers to impose treatment and rehabilitation in their sentencing verdicts, and that neurorehabilitation is an appropriate treatment for those with TBI which can lead to improved outcomes (J. Brown et al., 2018; Schofield et al., 2006).

A further limitation of this Experiment was that the video materials were not balanced in length. Whilst attention was paid to ensure that the content and the style of the videos were matched across the three conditions, the duration of the personal narrative video clip was longer than both the non-narrative (3m 55s versus 2m 41s) and filler video (3m 55s versus 1m 44s). Other research has balanced the information in content and length (e.g., De Iorio et al., 2017; Schellinger et al., 2018), and future research should also seek to balance the length of educational materials across experimental conditions. Broader limitations pertaining to methodological limitations of legal decision-making research designs are discussed in the following discussion chapter (see Chapter 9).

8.6.2 Conclusions

The aim of this experiment was to explore the effect of presenting personalised and depersonalised educational information about TBI on sentencing severity ratings of a defendant with a history of TBI. Findings revealed that viewing either form of educational video about the causes and consequences of brain injury led to lower sentencing ratings compared to when no educational materials were presented. Contrary to expectations, a personal narrative did not have a greater effect on sentencing severity ratings compared to non-narrative information. However, in other findings some differences were shown between narrative and non-narrative information. For instance, participants were more empathetic towards the defendant when a personal narrative was included compared to both non-narrative and no educational information. Furthermore, the defendant's brain injury was viewed as more serious and with poorer recovery potential after viewing the additional contextual information. However, this effect was greater with the personal narrative compared to the non-narrative information. Mediation analysis showed that there was no direct pathway between educational materials and sentencing recommendations, but rather, empathy and blame mediated the relationship. Thus, the educational materials reduced sentencing ratings by increasing empathy towards the defendant, and then by lowering blame attributions. This effect was stronger for a personal narrative and led to a lower sentencing rating compared to non-narrative information. Future research should consider expanding the current sentencing options questions and incorporate questions related to rehabilitation as this is within the scope of magistrate's sentencing powers and an appropriate intervention for those with TBI.

Chapter 8: Key Messages

- This study aimed to explore how different types of educational materials (personal narrative and non-narrative information) about brain injury, in addition to a description of the defendants TBI, influenced ‘mock’ legal decision makers sentencing severity ratings when compared to a description alone.
- The addition of both types of education materials led to lower sentencing severity ratings for a defendant with TBI. However, contrary to expectations, confirmatory analysis found that both education types had a similar effect on sentencing severity ratings.
- The underlying mechanisms responsible for the relationship between TBI presentation and sentencing severity ratings were explored, and the decision pathway was shown to be mediated indirectly through state levels of empathy and blame attributions. Furthermore, a personal narrative had a greater effect on empathy levels and led to a greater adjustment to sentencing.

Chapter 9 General Discussion

The overarching aim of this thesis was to explore how individuals with TBI are perceived in the context of a UK magistrates' court, and how information about a person who has offended with a history of TBI is evaluated in sentencing recommendations. Previous research has explored how police officers, probation staff, and prison staff perceive a person who has offended with a history of TBI (McMillan, 2022; O'Rourke et al., 2018; Yuhasz, 2013), yet one critical timepoint in a defendant's journey through the CJS has so far received little attention: the point at which the defendant is tried and sentenced. Whilst evidence indicates that TBI is prevalent amongst incarcerated populations, little is known about how key individuals (e.g., judges, magistrates) evaluate information about TBI disability when making sentencing decisions. Furthermore, the limited available experimental evidence that does exist was conducted in the USA, which differs in many ways from the UK legal system (St Pierre & Parente, 2016, 2018). This thesis is therefore, the first to investigate how perceptions of defendants affect sentencing recommendations in the context of the British Magistrates' court system, albeit in a sample of 'mock' legal decision makers drawn from the general adult population. To achieve this aim, two new measures were developed to explore knowledge and misconceptions (PBIM36) of, and social attitudes (BIAS20) towards, individuals with brain injury. Following this, a series of experiments were conducted to examine the impact of TBI and its invisible nature on sentencing recommendations. First, this discussion summarises the key findings from the PBIM36 and BIAS20, including potential applications of these two new measures. Second, the overall findings of the magistrate's studies are outlined, along with possible theoretical implications. Finally, strengths, limitations and wider implications are considered, leading to a discussion of future research directions.

9.1 Summary of Findings – Social Perceptions of Brain Injury

Whilst the overarching aim of this thesis was to investigate perceptions of defendants in the context of the CJS, Chapter 2 outlined the conceptual and psychometric limitations to the current tools adopted to measure perceptions of brain injury more generally amongst laypersons. Consequently, two novel measures, namely the PBIM36 and BIAS20, were developed to holistically evaluate laypersons knowledge of, and attitudes towards, brain injury. Whilst the construct validity of the PBIM36 and BIAS20 remains inconclusive and requires further examination in future research, these measures potentially extend and improve upon existing tools designed to measure misconceptions and perceptions of brain injury.

First, the PBIM36 was designed to holistically evaluate knowledge-based perceptions using a biopsychosocial framework (WHO, 2002), incorporating important yet previously neglected aspects of brain injury. For example, it provides broader item coverage than existing scales (e.g., CM-TBI; Springer et al., 1997) and incorporates items pertaining to the social consequences of brain injury (e.g., homelessness, substance misuse, offending). Thus, the resultant scale not only provides broader item coverage, but was also developed using a much more rigorous approach to both item development and psychometric evaluation.

One advantage of the development process of the PBIM36 over other measures (e.g., Gouvier et al., 1988; Springer et al., 1997) is the inclusion of a professional sample to draw comparisons between professional and layperson responses. This process not only showed that the PBIM36 discriminates between professionals’ and laypersons’ knowledge of TBI across all subscales (i.e., with professionals demonstrating more accurate knowledge), but also enabled further in-depth exploration of key areas where perceptions were especially inaccurate in laypersons. For instance, laypersons were more likely to endorse views that linked overall recovery from brain injury to the same trajectory as physical recovery. That is, laypersons expect to see a physical marker of disability, and more frequently expect recovery from the hidden cognitive, emotional, and social impacts of brain injury to occur concurrently with physical recovery. This may be problematic for those with TBI disability, as typically the most improvement in physical recovery is seen in the first six months after a TBI (Stocchetti & Zanier, 2016). Subsequently, the various hidden cognitive, emotional, and behavioural sequalae associated with TBI disability may be more likely to be misattributed to other causes, or overlooked completely, without a physical marker to signify presence of TBI disability. Consequently, key individuals (i.e., family and friends) may not recognise the ongoing long-term challenges that survivors face. Additionally, neurorehabilitation, which has been shown to be beneficial and cost-effective for those with brain injury, typically focuses on improving psychosocial outcomes (Turner-Stokes, 2018; Turner-Stokes et al., 2015; UKABIF, 2018), whereas laypersons tend to believe that recovery and rehabilitation focuses on achieving good physical outcomes. Thus, the most inaccurate perceptions of brain injury in laypersons tend to centre around medical expectations and poor understanding of the recovery process.

Second, while a substantial amount of research has focused on knowledge-based perceptions and misconceptions of brain injury, attitude-based perceptions have been largely ignored (see Chapter 2). According to the biopsychosocial framework, environmental factors, including prevailing societal attitudes, are critical to understanding the social context of the individual with disability (WHO, 2002). Consequently, attitude-based measures are sorely needed, yet until the BIAS20 was developed, no measure had been specifically devised for this purpose. The BIAS20 captures perceptions pertaining to social inclusivity, empathy, risk, and genuineness.

One advantage of this tool is that it broadly examines similar themes adopted in general attitude-based research, such as the British Attitude Survey (BAS), which evaluates attitudes towards those with disability (Staniland, 2009). Indeed, a key focus of the BIAS20 is exploring the public's willingness to interact with those with disability, reflecting items contained in the 'Social Inclusion' subscale of the BIAS20. Furthermore, items in the 'genuineness' subscale thematically link to commonly reported challenges faced by those with invisible disabilities. Notably, these include feeling misunderstood, not feeling believed about symptoms, and suggestions of symptoms exaggeration (Olkin et al., 2019). Thus, the BIAS20 captures perceptions which may underpin some of the social barriers that those living with TBI disability frequently experience.

Notably, Chapter 5 revealed that professionals generally hold more socially inclusive attitudes than laypersons towards people with brain injury. This contrasts to research focusing on attitudes towards those with mental illness (MI), whereby professionals were shown to hold largely similar views on social distancing to laypersons (Lauber et al., 2006). Notably, the desire to socially distance increased as level of proximity to the individual with MI got closer (Lauber et al., 2006). This trajectory is similar for laypersons with the BIAS20, but not for professionals. Thus, for laypersons, the proximity of social contact appears to be important for social inclusivity. For instance, professionals endorsed more positive attitudes compared to laypersons when the social interaction involved close proximity to the individual with brain injury - i.e., 'conversation,' 'mixing,' 'interacting' and 'meeting' someone with a brain injury. However, little difference between professional and layperson responses was observed when social inclusivity would likely include more distant social interaction (i.e., renting a house to someone with a brain injury). Thus, the proximity of the social interaction is key to understanding the differences observed between professionals and laypersons.

Research investigating stigma and discrimination towards those with MI shows that perceptions of dangerousness tend to lead to fear and avoidance behaviours (e.g., P.W Corrigan et al., 2002; 2003). Consequently, if attitudes towards those with brain injury are underpinned by the same mechanisms as those for MI, it might be anticipated that attitudes favouring social distancing (i.e., low social inclusivity scores) in laypersons would be coupled with greater perceptions of risk and dangerousness in comparison to professionals. However, the reverse pattern was observed in Chapter 5, such that professionals tended to consider those with brain injury a greater risk compared to laypersons across the individual risk and dangerousness items (e.g., *People with brain injury are unlikely to be a danger to themselves or others*). Thus, perceiving a person with brain injury as dangerous is not an adequate explanation for why social inclusivity attitudes are lower in laypersons compared to professionals. Notably, perceptions of dangerousness did not differ across the magistrates' studies either, when a defendant with a brain injury was compared to a defendant with no history of brain injury. Therefore, low familiarity and proximity with brain injury rather than perceptions of dangerousness may help explain why laypersons endorse greater levels of social distancing compared to professionals, given that laypersons tended to report low proximity with brain injury across the research conducted in this thesis.

9.2 Applications of the PBIM36 and BIAS20

The PBIM36 and BIAS20 have multiple potential applications, including: (1) identifying knowledge gaps and negative societal attitudes towards those living with TBI-related disability; and (2) research applications, such as drawing on perception-based research data to develop and inform research themes for future experimentation. These potential applications are discussed below.

First, identifying gaps in knowledge and negative societal attitudes are important for addressing social barriers for those living with TBI disability (WHO, 2011). Here, the PBIM36 consistently discriminated between professional and laypersons knowledge, and is therefore an ideal instrument to further explore layperson understanding and knowledge if brain injury. Furthermore, the BIAS20 may help elucidate social attitudes which explain some of the social barriers commonly faced by those living with TBI-related disability. Understanding and exploring public perceptions can identify key areas to target in public health campaigns and educational interventions (WHO, 2011). In Chapter 5 and explained briefly above, findings revealed that the public expect physical recovery to be a good indicator of overall recovery following a TBI, and that rehabilitation focuses on improving the physical aspects of recovery. Thus, laypersons demonstrated poor understanding of the need for treatment to focus on the hidden impacts of TBI disability. Consequently, these misperceptions are key areas to potentially target in educational and public awareness campaigns. Beyond public awareness campaigns, other key individuals to target for training to increase understanding of the long-term effects of TBI include educators and non-expert health professionals (see Linden et al., 2013; McKinlay & Buck 2018; Oyesanya & Sneddon, 2018). Indeed, in education for example, poor recognition that the trajectory of recovery does not follow the same pathway as physical recovery may lead to the needs of a child with TBI being overlooked amongst educators, particularly given that difficulties associated with childhood TBI may emerge over time (e.g., Howe & Ball, 2017).

Second, the PBIM36 and BIAS20 measures can be used as research tools. In this thesis, these tools informed the decision to focus on the invisible nature of TBI throughout the experimental chapters. For instance, professional and lay samples were compared in Chapter 5, which identified injury invisibility as a key area for experimentation, ultimately resulting in the inclusion of a physical marker of TBI disability in Experiment One. Without such in depth exploration in the early stages of this thesis, important aspects of perceptions may have been neglected in this body of experimental research or potentially led to experimentation and exploration of variables unlikely to be factors influencing decision making. In addition to informing experimental manipulations, the PBIM36 and BIAS20 were also included to conduct initial exploratory analysis concerning the potential impact of knowledge and attitudes on sentencing decisions and recommendations. Whilst the design of the experiments meant that they could not be consistently used in the analysis as covariates, it was still possible to explore whether they were contributing to the sentencing recommendations. For example, Chapter 7 &8 provided initial evidence that more positive attitudes and more accurate knowledge about TBI was related, albeit weakly and somewhat inconsistently, to sentencing decisions. Thus, it appears that attitudes and knowledge may be important baseline factors to consider in future research, with the newly developed tools providing a good basis for such exploration in future deigns (e.g., baseline measure; experiment two weeks later).

9.3 Summary of Findings – Perceptions of Defendants with TBI in a Magistrates' Court

Having identified that laypeople tend to harbour significant misconceptions about the time course of TBI recovery, the next step in this thesis was to examine whether, and how, these misconceptions affect sentencing recommendations in a sample of 'mock' legal decision makers in the context of a Magistrates' court. Typically, simulation research focuses on how mock jurors (i.e., within a crown court setting) make verdict decisions and evaluate trial information (e.g., Bornstein & Greene, 2011; Bornstein et al., 2017; de la Fuente et al., 2003; Mobbs et al., 2007; Mossière & Maeder, 2015; Schweitzer & Nuñez, 2018), with little attention paid to how information is evaluated in a magistrates' court setting – despite most trials being completed in this setting in the UK (Courts and Tribunals Judiciary, 2022b). Across three experiments, two broad patterns of findings emerged. Notably, without additional context, laypersons struggle to account for the impacts of TBI when making sentencing recommendations. However, educational materials can provide important contextual information which allows laypersons to account for the ongoing impacts of TBI when rendering a sentencing decision. That is, sentencing recommendations tended to be less severe for defendants with a history of TBI, but only when the description of the TBI was accompanied by educational materials.

9.3.1 TBI – an Invisible Disability in Sentencing Decisions

A consistent finding across all three experiments was that presenting information about a history of TBI, by itself, did not lead participants to adjust their sentencing recommendations. In the first experiment (Chapter 6), a defendant with a history of TBI was rated similarly to a defendant without a history of TBI, irrespective of whether the TBI was accompanied by a resolved or current physical marker of TBI disability. However, although the presence or absence of physical markers did not affect sentencing ratings, they did affect how participants perceived the severity and impact of the defendant's brain injury. Indeed, participants perceived the defendant with TBI with resolved physical health issues, as having made a better overall recovery. Furthermore, participants also perceived this defendant as having better recovery potential in the future compared to a defendant with TBI who had ongoing physical health issues. These observed differences align closely to the broader thematic findings outlined in Chapter 5, whereby laypersons perceived physical recovery to be a good indicator of overall recovery. Furthermore, a TBI with ongoing physical health issues was viewed as more serious compared to a TBI with no physical health issues, demonstrating that without an accompanying physical maker, the hidden effects of TBI were viewed as less serious.

Importantly, the rated importance of each of the aggravating and mitigating factors – including the presence of a TBI - did not change after viewing information about TBI. Thus, whilst participants viewed the defendants' brain injury as being more severe and impactful on functioning, they were unable to adjust their decision to take account of the injury. However, as previously discussed in Chapter 7, it was possible that these null findings were caused by an anchoring effect, whereby participants' ratings closely aligned to the magistrates' own sentencing verdict.

To address this possibility, the second experiment included a new and additional sentencing decision timepoint *prior* to the magistrates' own sentencing verdict. However, despite this methodological change, the findings of the second experiment largely replicated the first. That is, presenting information about the defendant's history of TBI (absent of any educational materials) did not affect sentencing recommendations when compared to a defendant with no history of TBI.

Furthermore, no further differences were observed between a defendant with and without a history of TBI on exploratory measures, including perceived risk and dangerousness. Consequently, without accompanying contextual information, it is unlikely that participants fully factored the defendant's TBI disability into their sentencing recommendation. Consequently, one of the key findings drawn from Experiments One and Two is that TBI potentially remains an invisible disability to decision makers in criminal sentencing trials, even when information about the ongoing impact of the TBI disability is available.

9.3.2 TBI – Increasing Visibility of TBI Disability through Educational Materials

A key aim in the Experiments Two and Three was to increase the visibility of TBI disability to participants through inclusion of contextual information (in the form of educational material) about brain injury. In Experiment Two, a non-narrative (i.e., factual) video explained the main causes of brain injury, along with the hidden and long-term effects. The same video was presented in Experiment Three, along with a new TBI presentation condition where a video containing a personal narrative recounting the lived experience of the hidden and ongoing effects of TBI, was presented. Across Experiments Two and Three, less severe sentencing recommendations were made when these educational materials were provided than when they were absent. In Experiment Two, not only did the defendant receive a lower sentencing recommendation when the non-narrative video was presented, but participants also rated the TBI information as more influential in their sentencing decision compared to when no educational materials were presented. These results provide evidence that educational information, which contextualises the complex and long-lasting impacts of TBI, may enable decision-makers to better factor the defendant's TBI into the sentencing decision. Educational information may therefore be a promising way to increase comprehension of TBI disability, and may potentially enable key legal decision-makers adjust their decision-making appropriately to take account of TBI information presented in criminal trials.

Experiment Three examined the potential impacts of different types of educational videos on decision-making. Supporting the main finding in the second magistrates' experiment, irrespective of education type (i.e., narrative and non-narrative), the presence of educational materials about brain injury led to less severe sentencing recommendations. However, notably, both types of educational information tested had a similar effect on sentencing recommendations in confirmatory analysis. Experiments Two and Three suggest that educational information about brain injury enables a greater understanding of its ongoing impacts, and consequently leads to adjustments in decision-making. Furthermore, different types of educational information (i.e., narrative and non-narrative) were effective in increasing the visibility of TBI disability, potentially because decision-makers attention was drawn to the TBI information and was contextualised.

9.4 Theoretical Implications of Findings

Contextual information (e.g., educational materials) about TBI is key to increasing understanding of the ongoing, and hidden impacts of TBI amongst laypersons, and may represent a key area to target amongst key legal decision makers including magistrates. Increasing magistrates' understanding of the long-term effects of TBI may therefore be needed in order that TBI information is taken into consideration in important legal decisions such as sentencing decisions. Prior research has similarly found that greater recognition of the consequences of TBI is important in how explanations of behaviour are attributed (e.g., De Iorio et al., 2017; McClure et al., 2006; McClure & McDowall, 2008). However, research by McClure et al. (2006) and De Iorio et al. (2017) referred to an adolescent in their research and provided information about behavioural changes that could be either attributed to TBI or adolescence, thus making the reason for behavioural changes ambiguous to participants. Following this, participants rated whether TBI or adolescence was a better explanation of behavioural changes. This ambiguity over whether TBI was a better explanation for behaviour compared to another causal factor was absent in the magistrates' series of experiments. Indeed, no alternative explanation of behaviour was included, and participants were informed that the defendant's TBI may have contributed to their actions in regard to the assault. Even so, participants failed to account for this TBI information in their sentencing decision without additional contextual information about brain injury. Poor understanding of the long-term effects and nature of recovery from TBI likely drove this lack of adjustment, rendering the TBI invisible to decision-makers.

In addition to lack of understanding of TBI, perceived seriousness of the TBI may also be important. Indeed, McClure et al. (2008) found that when a TBI is perceived as more serious, behaviours are more likely to be attributed to the TBI rather than an alternative explanation of behaviour. However, in the present experiments. different types of educational information had similar effects on sentencing recommendations, but different effects on perceived severity. For instance, perceived severity of TBI was only greater compared to an absence of contextual information when the personal narrative video was presented. Thus, this may mean that it is not necessary for a TBI to be perceived as more serious in order to affect decision making.

It is more likely that misconceptions surrounding the nature of the recovery process after TBI underpinned the key findings across the magistrates' experiments given that misconceptions can lead to misattributions of behaviour (McClure & Abbot, 2009). McClure and Abbot (2009) explored the 'Abnormal Conditions Focus Model' whereby perceived normality of behaviour is considered important in how an individual's actions are judged (Hilton & Slugoski, 1986). In this model, the causal attribution of behaviours include *consensus* (i.e., behaviour fits/ does not fit with normative peers), *distinctiveness* (i.e., present circumstances are distinctive) and *consistency* (i.e., behaviour is viewed as consistent/ inconsistent with past behaviours; Hilton & Slugoski, 1986). For instance, following previewing a scenario about an adolescent with a TBI, behavioural changes described in the scenario were attributed more frequently to personality when behaviours were described as *consistent* (i.e., normal) for the individual (pre-and post-injury). By contrast, behaviours were attributed to the TBI more frequently when the behaviours were described as abnormal (i.e., low *consistency*) for the adolescent. 'This 'Abnormal Focus Model' (Hilton & Slugoski, 1986) may also help explain findings across the magistrates' experiments, as participants may not have been able to distinguish between behaviours that were present pre- and post-injury (i.e., recognise that behavioural changes occurred post-injury) without the additional contextual information.

Potentially most relevant to the present magistrates' experiments is therefore how decision-makers viewed the *consistency* (i.e., behavioural normalcy; Hilton & Slugoski, 1986) of the defendant's behaviour when contextual information was absent. For instance, based on the TBI information provided and (lack of) prior knowledge of TBI, participants may not have viewed the offending behaviour as potentially linked to the cognitive, emotional, and behavioural consequences of the

TBI disability. As such, it is possible that in the absence of contextual information to explain how TBI affects an individual post-injury, decision-makers may have viewed the offending behaviour as consistent (high consistency – HC) with pre-injury factors. Thus, participants may have judged that the defendant's behaviours outlined in the case materials were present prior to the TBI injury or at least, could not make a confident assessment of whether they constituted marked differences in pre- and post-injury behaviour. For instance, pre-injury factors may be accounted by factors such as personality or age (e.g., McClure & Abbott, 2009). Consequently, the TBI information was subsequently discounted in the following sentencing decision, potentially explaining why sentencing judgements did not differ between a defendant with and without a history of TBI. Figure 9.1 (below) combines findings from experiments One to Three in a proposed visual representation of the sentencing decision pathways. The figure shows the pathway to the sentencing decision when contextual information is absent. Here, poor understanding of the ongoing effects of TBI, may mean that decision makers potentially perceive the defendant's behaviour as consistent between pre- and post-injury. Consequently, this renders the TBI invisible to decision makers, whereby no adjustment is made to the sentencing decision.

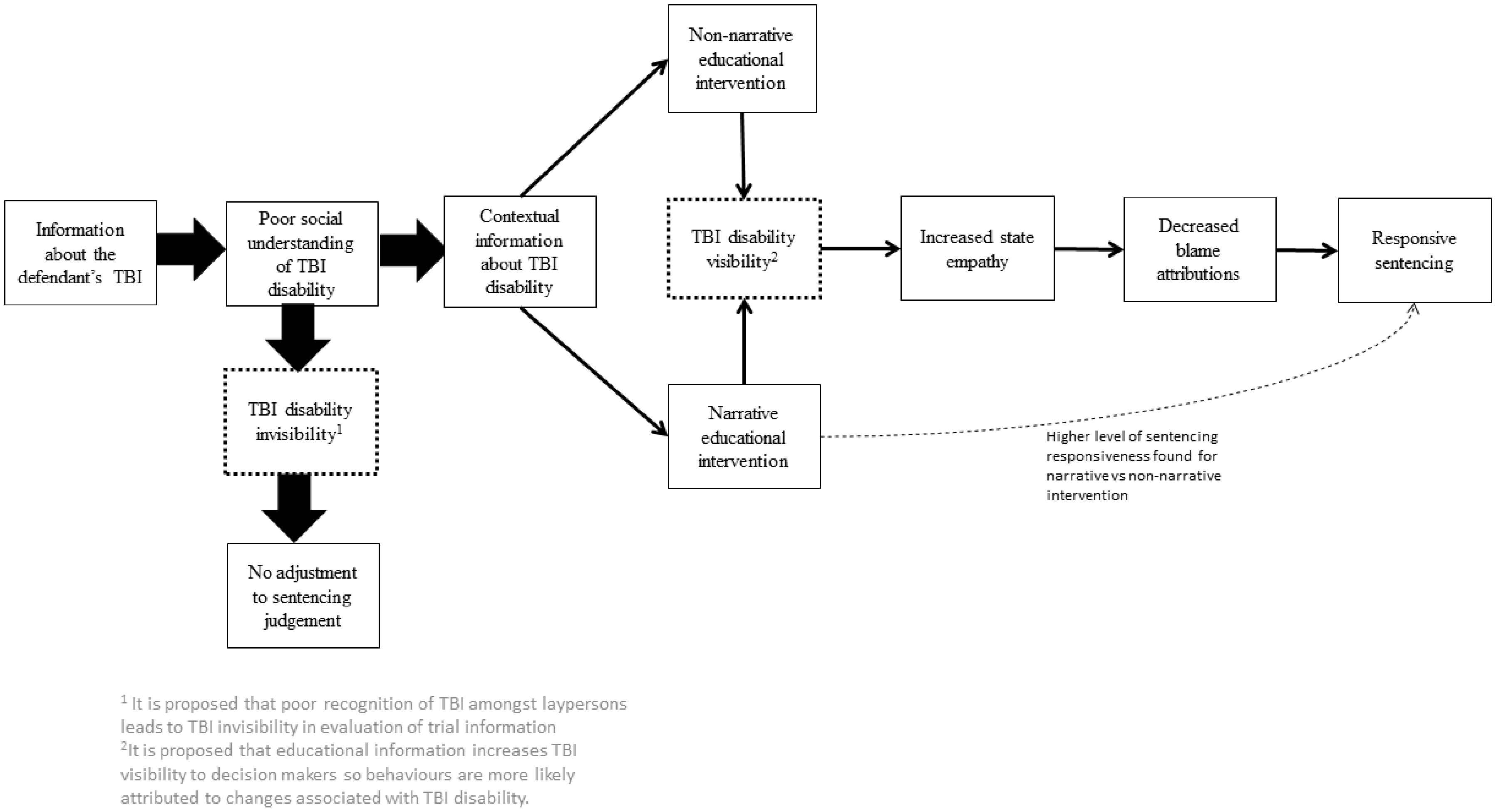

Figure 9.1 *Proposed Visual Representation of the Sentencing Decision Pathway (SDP)*

Contextual information may therefore help by lowering the perceived consistency between pre-and post-injury behaviours. De Iorio et al. (2017) found that changes in behaviour were more frequently attributed to TBI when educational information was presented. Furthermore, McClure and Abbott (2009) found that when behaviour was presented as abnormal compared to pre-injury behaviour, participants were more likely endorse TBI as a causal explanation of behaviour. Thus, the contextual information presented in De Iorio et al.'s (2017) study may have drawn greater attention to behavioural changes associated with TBI and particularly in relation to the personal narrative which included pre- versus post- injury experiences, as the TBI explanation of behaviour was more frequently endorsed for this condition. A similar effect is possibly present in the magistrates' experiments. Indeed, contextual information may have enabled decision-makers to recognise a behavioural change in the defendant pre- and post-injury, and as such. a greater understanding of low *consistency* (LC) between behaviour before and after the defendant had sustained a TBI. This greater understanding of the ongoing effects of the defendant's TBI may have increased the visibility of the TBI disability to decision-makers so that it was subsequently factored into the sentencing recommendation (see Figure 9.1 for the pathway when contextual information was presented). However, further research is needed to establish if consistency (i.e., low with contextual information and high without contextual information) is a good explanation of these findings.

Different types of contextual information (i.e., narrative and non-narrative educational materials) may lead to evaluations of low *consistency* between pre- and post-injury behaviours. Broadly reflecting De Iorio et al.'s (2017) findings showing that different types of educational information can increase the visibility of TBI disability, Experiment Three found that narrative and non-narrative information were effective in lowering sentencing recommendations. However, whilst narrative and non-narrative materials may have lowered evaluations of consistency between pre- and post-injury behaviours, they should not be viewed as equivalent in their effects. To consider this further, it is important to understand that the relationship between educational materials and sentencing recommendations was indirect and mediated via increased state empathy leading to lower blame attributions. Consistent with prior research (e.g., Jung, 2015; J. L. Wood et al., 2014), blame attributions and state empathy were important to sentencing judgements. Yet notably, whilst blame levels were equivalent across both education types, affecting sentencing recommendations similarly, a personal narrative elicited a greater level of empathy towards the defendant compared to non-narrative educational materials. Consequently, the sentencing recommendation was lower after viewing the personal narrative compared to non-narrative information, but only when state levels of empathy was included as a mediator.

The personal narrative may have transported the decision maker into the lived experience of a survivor of TBI, thus eliciting a greater empathic response (Green & Brock, 2000; Green et al., 2004; Kreutzer et al., 2007; Murphy et al., 2013). However, another possibility is that the personal narrative drew greater attention to behavioural changes following a TBI, thus highlighting the low *consistency* between pre- and post-injury behaviours. Indeed, the personal narrative presented in Experiment Three included descriptions of the “old self” versus the “new self”. This information may lead to increased understanding of the behavioural changes associated with TBI. Behavioural changes after TBI are well documented and can include increased aggression and changes to emotional regulation (e.g., Alderman, 2007; Alderman et al., 2013; C. Williams et al., 2020; R. Ll. Wood, 2001). Behavioural changes associated with TBI may be relevant factors for decision- makers to consider when evaluating the case materials, particularly in light of criminal behaviours such as assault. Thus, it is important to consider the type of information that needs to be conveyed in educational interventions so that it can help decision-makers draw a distinction between pre- and post-injury factors which may be relevant in criminal trials.

When designing educational interventions for key decision-makers in the CJS, the effect of both types of educational materials on increasing visibility of TBI disability should not be viewed as equivalent despite confirmatory analysis revealing no difference between narrative and non-narrative educational materials. Rather, educational interventions should seek to ensure that personal narratives of survivors and their lived experience of TBI are included, given that mediation analysis showed that may be more effective at increasing the empathy and potentially increasing understanding of pre- and post-injury changes compared to non-narrative information.

9.5 Strengths and Limitations

9.5.1 Strengths of the Magistrates' Experiments

One of the key strengths of this thesis is that the fictional case materials were contextualised in the UK's magistrates' court system, with the case developed using an example from the UK sentencing council (Sentencing Council, n.d.). Typically, research designs tend to adopt a 'mock juror' (e.g., fictional trial simulation) paradigm (Bornstein et al., 2017; Schweitzer & Nuñez, 2018), which is not only commonly contextualised in the crown court system, but also tends to be focused on the American judicial system, particularly in relation to sentencing (e.g., Green & Cahill, 2012; Jung, 2015). In the UK, however, only 5-10 % of trials reach the crown court; the vast majority of cases are adjudicated within the Magistrates' court system

(Courts and Tribunals Judiciary, 2022b). Thus, mock juror designs have quite limited relevance to the UK courts system. By focusing on a more representative criminal case, the materials in the magistrates' experiments are more relevant to the UK courts system and sentencing council guidelines.

A second strength of this thesis is the experiments were informed by a systematic evaluation of attitudes towards, and (mis)understandings of TBI. Indeed, extending on prior research showing that the public hold significant misconceptions about TBI (e.g., Gouvier et al., 1988; Hux et al., 2006; Springer et al., 1997), the PBIM36 also showed that poor understanding of the recovery process following a TBI is critical to consider in experimentation. Not only this, but non-expert professional populations (e.g., nurses, police populations) hold similar misconceptions to the public (e.g., McMillan, 2022; Oyesanya et al., 2016). Thus, it is reasonable to surmise that key legal decision makers (e.g., magistrates, judges) also hold similar misperceptions about brain injury, although no research has yet been conducted to assess this. Factoring these misperceptions into the materials and design of the magistrates' experiments not only assisted in identifying focal points for experimental manipulations, but the measures were also included to explore the relationship between sentencing recommendations and knowledge, of and attitudes towards, brain injury. Thus, understanding the social context of a defendant with TBI may be relevant to real world criminal trials and sentencing, as increasing comprehension and understanding of TBI may be necessary before it can be fully appreciated and appropriately factored into sentencing decisions.

9.5.2 Limitations of Trial Simulation Research

Although trial simulation research using fictional case materials is typically adopted to investigate factors influencing verdicts and sentencing, the external validity of such designs may be limited owing to the focus on internal validity (Wiener et al., 2011). Indeed, one of the strengths of type of design is its good internal validity, due to a high degree of experimental control, such as random assignment of participants to conditions, and highly controlled experimental manipulations (Bornstein et al., 2017; Wiener et al., 2011). Experimental control enables researchers to draw causal inferences based on statistical analysis and hypothesis testing (Bornstein et al., 2017; Wiener et al., 2011). Conversely, however, the external (i.e., generalisability) and construct (i.e., realism) validity of these research designs tend to be lower (Wiener et al., 2011). One main criticism of trial simulations research is how trial information is typically presented to participants (see Bornstein, 1997). Mostly, researchers present trial information in written from, although some researchers have moved towards greater verisimilitude (e.g., videotaped mock trials, and post-trial interview with jurors) which is generally considered more favourable as an approach (e.g., Diamond, 1997). Even so, Bornstein's (1997) review of trial simulation research did not find notable differences between different types of information presented in trial simulation research.

One further threat to the external and construct validity of trial simulation research is that researchers commonly rely on student samples, and thus sampling may not be sufficiently representative of a 'jury eligible' general population (e.g., Bornstein et al., 2017; Keller & Wiener, 2011; Wiener et al., 2011). To test whether an over reliance on student samples poses a problem for trial simulation research, Keller and Wiener (2011) explored whether two jury eligible samples, namely a sample of undergraduate students (n = 120) and a sample of community sample (n = 99) differed in how they responded to a series of fictional crime cases. Differences in guilt ratings were found between the student and community samples (Keller &

Wiener, 2011). For instance, in sexual assault cases, pre-trial attitudes were a stronger predictor of guilty verdicts for community samples compared to the student sample, yet attitudes towards rape was a better predictor of guilt verdict in the student than community sample. For homicide cases, students were more lenient in their guilt ratings compared to the community sample. Thus, it is important to recognise that students may react differently to trial materials compared to community samples (Keller & Wiener, 2011). However, findings from a meta- analysis of 53 trial simulation studies comparing student and community-based sampling, either showed small differences between student and community samples or no difference when guilty verdicts, guilt ratings or sentencing of defendants were considered (Bornstein et al., 2017). Even so, whilst this meta-analysis provides confidence in use of students in sampling for trial simulation research, it should not be used to undermine the need to increase realism to improve construct validity (see Wiener et al., 2011).

Improving on trial simulation research which typically relies on student samples (e.g., Jung, 2015; Mossiere & Maeder, 2015) including St Pierre and Parente's (2016; 2018) research focusing on defendants with TBI, both community members and student were sampled for the magistrates' series of experiments. However, trained magistrates were not recruited as participants. Whilst magistrates are peer members of the community, who sit in their role in a voluntary capacity (Courts and Tribunals Judiciary, 2022b), there may be systematic differences between members of the general population and magistrates that might affect how they would respond to a defendant who presents with a TBI. For example, there are some key demographic differences between the samples recruited for the magistrates' experiments compared to recently published statistics of magistrates in the UK (Diversity of the Judiciary: 2023 Statistics, 2023). Compared to the general population samples recruited for the magistrates' experiments, magistrates tend to be in a higher age bracket (29% > 50-59 years; 53% .> over 60 years) with a higher proportion of males (males = 43%; females = 57%; Diversity of the Judiciary: 2023 Statistics, 2023).Whilst these differences need recognition as a limitation, further research is needed to explore how such differences might impact on how TBI information is evaluated.

Notwithstanding the aforementioned limitations, given the lack of research in this field, it is necessary for preliminary research to focus on investigations and experimental designs which have high levels of internal validity to draw causal inferences. To do this, large samples are needed to ensure adequate power for detecting differences between conditions (e.g., Lakens, 2014; Lakens & Caldwell, 2019), thus recruiting from a general population is an important means to achieving this. However, future research should seek to sample directly from populations more closely aligned to the population of interest (see Wiener et al., 2011), such as those who are key to determining sentencing decisions, including magistrates.

9.6 Implications for the CJS – Key Recommendations

Prior research has typically involved surveying professionals who tend to work in closer proximity to those with TBI compared to judges and magistrates, such as police populations (McMillan, 2022), healthcare professionals working in prisons (Yuhasz, 2013) and probation staff who support people who have offended in a range of settings across the CJS (O'Rourke et al., 2018a). Such research has pointed to the need for educational interventions to counter misconceptions and increase understanding of behaviours associated with TBI which may be misreported to courts as non- compliance or the defendant being 'difficult' (see McMillan, 2022). The contribution of this thesis is to show that these misunderstandings can lead to injury invisibility when it comes to sentencing recommendations. Consequently, poor understanding of disability, including TBI disability, in court settings can mean that those facing criminal trials are not treated fairly due to a lack of accommodation and improper representation (Leotti & Slaytpier, 2022).

Following increased recognition that TBI disability is highly prevalent in individuals who come into contact with the CJS (e.g., Farrer & Hedges, 2011; Hughes et al., 2015; Pitman et al., 2015; Shiroma et al., 2010; H. Williams, 2012; W.H. Williams et al., 2018), work is being undertaken to provide better screening for those with TBI so people who have offended can be appropriately managed and supported (Pitman et al., 2015). So far, greater attention has been paid to identifying history of TBI amongst prisoners (e.g., Hughes et al., 2015; Pitman et al., 2015), although arguably, screening should take place at an earlier timepoint in the CJS (Pitman et al., 2015). A recently published report by the Criminal Justice Joint Inspectorate (CJJI, 2021) highlighted the need for more robust screening procedures throughout the CJS to identify people who have offended with neurodivergence, including those with TBI. Currently, prevalence of neurodivergence in the CJS remains unclear (CJJI, 2021), and little data exists which points to prevalence of TBI at arrest, as well as during criminal trials and sentencing. Notably, the CJJI report further highlights that owing to poor screening procedures and reported time pressures on magistrates to turn around cases quickly, pre-sentencing reports and assessments may not be carried out. Thus, vital information about a defendant's TBI disability may be lost or absent during trial procedures. Consequently, neurodivergence (including TBI) may not be taken into consideration during sentencing (CJJI, 2021), even if it can be taken into account.

Improved screening practices alone do not guarantee better management of those with TBI. Indeed, without educational interventions to increase understanding in

TBI in the courtroom, appropriate interventions or court diversion schemes (Heard, 2019; Schofield et al., 2006) may be overlooked. One example of where this is happening is the Brain Injury Linkworker programme currently being delivered in South Wales, by the Disabilities Trust, which focuses on training prison and probation staff (The Disabilities Trust, n.d.). Following the 'Ask, Understand, Adapt' model, which refers to the need for assessment, increased understanding of TBI through training, and critically, adjustment to how those who have offended are managed, an audit revealed improved behavioural outcomes for people who have offended with a history of TBI after this intervention (The Disabilities Trust, n.d.). Other charitable organisations, including Headway's *Justice Project*, have also been focusing on training a range of key professionals who work across the CJS, including police, appropriate adults, lawyers and prosecutors (Headway, n.d). Such educational programmes are potentially crucial to increasing recognition and understanding of TBI disability, and better management of people who have offended with a history of TBI disability.

The findings of this thesis suggest that a similar model to the 'Ask, Understand, Adapt' may be useful in the courtroom, such that training may enable key decision-makers to take full account of TBI impacts when deciding on appropriate interventions and sentencing. To be successful, such a programme would also require routine screening for TBI prior to trial so that TBI disability can be assessed during the pre-sentencing phase, aligning with the UK Sentencing Council Guidelines (see *S*entencing Council, n.d., a). Thus, the first key recommendation from this thesis is that routine screening for TBI should be carried out prior to the court trial processes so that the opportunity for TBI to be taken into consideration during sentencing is not overlooked. A second recommendation is that educational interventions should be implemented for key decision-makers involved in criminal (e.g., magistrates', legal advisors) to provide a better contextual understanding of the ongoing effects of TBI.

9.7 Future Directions

The experiments presented in this thesis suggest that increasing comprehension of TBI disability to key legal decision makers may be an important step in managing people with TBI who come into contact with the CJS. The next step in the research should more closely align the sample to the target population (Wiener et al., 2011) by recruiting key decision makers such as magistrates' and judges as participants. As survey-based research already points to the poor understanding of TBI amongst the public and non-expert professional populations (e.g., Gouvier et al., 1988; Guilmette & Paglia, 2004; Hux et al., 2006; McMillan, 2022; Springer et al., 1997; Yihasz, 2013), but moving beyond survey-based research designs to further explore understanding of TBI in the context of the CJS (including key legal decision makers) may also be beneficial. However, recruiting specialist populations such as magistrates' and judges, may not only be challenging but they are a smaller population to draw from than the general population. Thus, for such research smaller samples will be required, necessitating more statistically powerful research designs and or different methods (e.g., qualitative or mixed methods approaches).

To extend upon the findings of this thesis, future experimentation should focus on developing educational materials suitable for key legal decision makers such as magistrates. Furthermore, drawing on the key findings across the magistrates' experiments may ensure the educational materials have a maximum chance of being effective. Magistrates and legal advisors (who advise magistrates on sentencing decisions) are required to undergo mandatory training provided by the judiciary before, and whilst carrying out this role (Courts and Tribunals Judiciary, 2022a; Magistrates Association, n.d.). Training should also incorporate educational information about TBI disability, given the high likelihood that a magistrate will adjudicate trials with a person who has offended with a history of TBI disability. Thus, it is important to design education and training programmes specifically for this purpose. First, given that training time is limited for magistrates (i.e., three to five days prior to commencing role; Government Digital Service, 2015). and court time is limited (approx. 13 days per year; Government Digital Service, 2015), educational interventions need to take these practical limitations into consideration. Potentially, training could be delivered in video format following the same methods included in the magistrates' experiments. However, a longer, and more detailed programme focusing on the long term and hidden effects of brain injury would be better and one that also addresses key misconceptions as highlighted by robust measurement – such as the PBIM36 and BIAS20. Importantly, the materials should combine both narrative and non- narrative information as both were shown to similarly impact sentencing recommendations, although narrative information elicited a greater empathic response. The personal narrative in Experiment Three provided a survivors story of TBI, however, this did not include a survivor who had been in contact with the CJS. Future educational interventions designed for those involved in court trials may benefit from including personal stories of those who have been in contact with the CJS. This may increase understanding of how a survivor's offending behaviour may have been impacted by TBI disability. Factual content should focus on challenging misconceptions around the recovery process, as well as increasing understanding of the long term, hidden effects of TBI, and how these potentially link to offending behaviour. However, before rolling out the educational intervention, it is first important to test the educational materials to ensure they are effective. This could be achieved by following methods outlined by Rice (2018) using a pre- and post-design to ensure that contextual understanding of TBI has increased following the intervention. For example, the PBIM36 and BIAS20 could be used to survey key legal decision makers' knowledge of, and attitudes towards brain injury some time prior to an educational intervention, not only to provide a baseline measure of these, but to also ensure that key insights from these measures were subsequently used to inform materials for the educational intervention (e.g., areas of need). Furthermore, given that test-retest reliability was demonstrated to be sufficient for both the PBIM36 and BIAS20, a pre-post test change in scores could likely be attributed to the educational intervention, provided of course that a robust experimental design was adopted (e.g., randomisation, control condition included).

9.8 Thesis Conclusion

TBI disability can lead to long-lasting, yet often hidden consequences, which are poorly understood by the public and non-expert professionals. Within the context of the CJS, this thesis highlights how the invisible nature of TBI-related disability potentially leads to information about a defendant's TBI being overlooked during sentencing. However, contextual information about TBI may serve to increase the comprehension of TBI disability, allowing decision-makers to appropriately factor the TBI information into the sentencing recommendation. Educational interventions are potentially key to ensuring fairer treatment of individuals with TBI during sentencing. Without specialist education, decision-makers may not be able to recognise and adjust for the ongoing impacts of a TBI on an individual's behaviour. Future research should explore the effectiveness of an educational intervention designed specifically for key individuals involved in criminal trials. This thesis demonstrates that screening alone may not be sufficient; rather, key legal decision-makers may need educating in the effects of TBI to ensure fair and appropriate treatment of people with TBI in the CJS.

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Appendices

Appendix A

Perception of Brain Injury Measure (PBIM) – All Items

We are interested in your understanding and perceptions of brain injury. Please read the following statements and rate how true or how false you consider each statement. Please answer the questions as best you can.

Scaling: True / False format (7-point scale) 7-point scale: scored from negative to positive

Points system: 1 = Definitely False, 2 = Probably False, 3 = Possibly False, 4 = Uncertain, 5 = Possibly True, 6 = Probably True, 7 = Definitely True

Item number	Item	Removed				Retained
Domain: Causes of brain injury		Phase 1: Pilot Study 1	Phase 2: Screening	Phase 2 EFA	Phase 3: CFA	Form PBIM36
1	A brain injury sustained early in life (e.g. childhood, adolescence) can have		✓			
2	A sports concussion sustained in early life can have long-lasting impacts (P)		✓			
3	A brain injury as a result from a road traffic incident is typically more serious			✓		
4	A brain injury acquired in childhood has less of an impact than a brain injury			✓		
5	Childhood brain injuries are much more serious than adult brain injuries	✓				
6	Having one brain injury increases the chances of having another (P)					✓
7	Brain injury can occur without a direct blow to the head (P)		✓			

8	Penetrating forms of brain injury are more severe than non-penetrating forms (N)			✓		
9	Some degree of brain damage is probably fine, as we only use 10% of our brain		✓			
10	The impact of brain injury depends on the cause (e.g. fall, road traffic incident, sports	✓				
Domain: Identification of brain injury						
11	Brain injury can be as serious as a chronic physical health condition (e.g.		✓			
12	Chronic physical health conditions are more debilitating for a person than brain			✓		
13	It is not always easy to tell if someone has sustained a brain injury (P)		✓			
14	The effects of brain injury are often hidden and/or invisible (P)			✓		
15	The effects of brain injury are not always obvious (P)		✓			
16	Evidence of brain injury is always detectable from a brain scan (N)					✓
17	An abnormal brain scan is needed to confirm the presence of brain injury (N)			✓		
18	A brain scan is the best way to detect brain injury (N)	✓				
19	There's not much difference between a brain injury and mental illness (N)			✓		
20	The symptoms of mental illness closely resemble those of brain injury (N)	✓				
21	A person with brain injury can lose all of their memories, but can otherwise appear	✓				

22	Most people after brain injury experience amnesia (N)	✓				
23	Brain injury mostly affects memory, but in other ways a person can be					✓
24	Identifying the location of damage is not essential for understanding the	✓				
25	Having to use a wheelchair on a daily basis because of a disability indicates a			✓		
26	A physical disability (e.g. using a wheelchair / mobility aid) is more			✓		
27	A brain injury is a serious condition which significantly affects a person's		✓			
28	Daily activities are affected and restricted by brain injury (P)		✓			
29	Brain injury affects a person's ability to perform everyday tasks (P)		✓			
30	You can tell if someone has a brain injury by the way they look (N)		✓			
31	It is difficult to identify if someone has a brain injury by the way they act (P)			✓		
32	The severity of brain injury is lessened from being intoxicated at the time		✓			
33	Being intoxicated at the time of brain injury reduces its severity (N)		✓			
34	If brain injury occurs when someone is intoxicated, its impacts are lessened		✓			
Domain: Perceptions of recovery						
35	The effects of brain injury are permanent (P)					✓

36	The impact of brain injury is enduring and long-lasting (P)		✓			
37	Brain injury is a chronic and debilitating condition (P)		✓			
38	People with brain injury can fully recover (N)	✓				
39	The effects of brain injury are often insignificant and unremarkable (N)					✓
40	The impact and effects of brain injury do not lessen over time (P)	✓				
41	The effects of brain injury become more noticeable over time (P)			✓		
42	The symptoms of brain injury improve at a steady rate (N)			✓		
43	Without support, people with brain injury do not improve over time (P)	✓				
44	The effects of brain injury become more significant over time (P)	✓				
45	A complete recovery after brain injury is unlikely, even if the person tries hard to					✓
46	The effects of brain injury are stable over time (N)			✓		
47	The effects of brain injury do not resolve quickly (P)		✓			
48	The effects of brain injury are temporary and short lived (N)		✓			
49	Faking the effects of brain injury is easy (N)					✓
50	Mimicking the effects of brain injury is easy (N)					✓

51	Recovery after brain injury is focused on achieving good physical outcomes					✓
52	The primary goal of brain injury rehabilitation is to improve physical					✓
53	The full effects of brain injury become apparent over time (P)			✓		
54	The impact of childhood brain injury can take years to become apparent					✓
55	Even when injury occurs to the brain, a person's core essence will remain intact (N)	✓				
56	A spontaneous and full recovery is possible after a brain injury (N)	✓				
57	A person is unlikely to return to their normal self after a brain injury (P)					✓
58	The speed in which someone recovers after a brain injury depends on their	✓				
59	How well someone recovers after brain injury is not dependent on the	✓				
60	Once discharged from acute care, a full recovery has been achieved (N)		✓			
61	Once a good physical recovery has been achieved, the person is 100% better (N)		✓			
62	Physical, memory and social recovery occur at the same rate following brain injury					✓
63	Physical recovery from brain injury is a good indicator of overall recovery (N)					✓
64	The most improvement is often seen in the early stages after brain	✓				
65	Without support, people with brain injury continue to improve and get	✓				

66	The effects of brain injury often resolve within a few months (N)			✓		
67	A person with brain injury often recovers fully within a few weeks (N)		✓			
Domain: Effects of concussion and unconsciousness						
68	A concussion is normally harmless (N)					✓
69	A concussion rarely results in long-term difficulties for a person (N)	✓				
70	After a coma, a person can be completely normal (N)			✓		
71	After a person is knocked unconscious they can carry on as normal (N)	✓				
72	Concussion can result in brain injury (P)		✓			
73	Concussion can result in negative consequences for the person (P)		✓			
74	The effects of concussion are short-lived (N)			✓		
75	Concussion can occur without a loss of consciousness (e.g. being knocked out)		✓			
76	Concussion is not a serious event (N)		✓			
77	The impact of concussion is cumulative (the impact becomes					✓
78	The more concussions you experience, the more damaging they					✓
79	It is not possible to have a serious brain injury without losing consciousness (N)			✓		

80	Brain injury always involves a loss of consciousness (N)			✓		
81	The severity of brain injury increases with each additional concussion (P)					✓
Domain: Understanding Changes in the individual						
82	Changes in a person’s personality are uncommon after brain injury (N)					✓
83	A brain injury can cause a sudden change in a person’s personality (P)		✓			
84	Behavioural problems are uncommon after a brain injury (N)			✓		
85	Joining group conversations can be difficult after brain injury (P)			✓		
86	Brain injury rarely results in serious consequences (N)		✓			
87	Brain injury can have a big impact on a person (P)		✓			
88	Balance, coordination, and walking problems are common after brain		✓			
89	Many people experience difficulties with their speech after brain injury (P)	✓				
90	Families don’t often see many changes in their loved ones’ behaviour after brain		✓			
91	A brain injury does not affect a person’s family and/or loved ones (N)		✓			
92	Alcohol affects a person differently after brain injury (P)			✓		
93	The effects of alcohol are often more pronounced after brain injury (P)			✓		

94	Decision making is not typically affected by brain injury (N)					✓
95	The ability to make everyday decisions can be affected by brain injury (P)		✓			
96	The ability to make reasoned judgements can be affected by brain injury (P)		✓			
97	A person with brain injury finds it difficult to focus their attention on everyday		✓			
98	People are more distractible after brain injury (P)			✓		
99	People with brain injury are good at planning and organising their daily			✓		
100	Brain injury does not affect a person's ability to organise and plan activities (N)			✓		
101	Movement disorders are not normally associated with brain injury (N)	✓				
102	Sleeping difficulties are uncommon after brain injury (N)					✓
Domain: Social Consequences						
103	Being able to read other people's emotions can be affected by brain		✓			
104	The ability to appropriately recognise and read social cues can be		✓			
105	Brain injury affects a person's ability to empathise with the emotional needs of			✓		
106	A person can usually resume normal activities after brain injury (N)	✓				
107	Returning to work after brain injury is commonplace (N)				✓	

108	Most people with brain injury are fully functioning members of society (N)	✓				
109	Social isolation is commonplace after brain injury (P)		✓			
110	Most people with brain injury get into trouble with the law (P)					✓
111	People with brain injury are charged with more criminal offences than those	✓				
112	People with brain injury behave considerately towards others (N)	✓				
113	People with brain injury are aware of other people’s needs. (N)	✓				
114	People with brain injury are often unaware of any changes in			✓		
115	After brain injury, most people lack insight regarding the impact (if any) of	✓				
116	People with brain injury have a good understanding of the impact of their brain					✓
117	A person with brain injury best understands the consequences of their					✓
118	Talking to a person with brain injury is the best way to get an accurate picture of the	✓				
119	Many people with brain injury can feel a loss of their former self (P)		✓			
120	A person becomes a completely different person after brain injury (P)		✓			
121	Losing your sense of role and purpose in life is not normally a consequence of brain					✓
122	The ability to respond appropriately to social cues and situations is			✓		

123	People with brain injury find it difficult to inhibit their behaviour (P)			✓		
Domain: Brain injury coherence						
124	The effects (if any) of brain injury are obvious to the person with brain injury (N)					✓
125	People with brain injury find it difficult to adapt to the consequences (if any)			✓		
126	In general, the consequences of brain injury are not well understood (P)			✓		
127	Advances in science means that we have an excellent understanding of the	✓				
128	Most people have a clear picture and understanding of how their brain injury may					✓
Domain: Behavioural control and responsibility						
129	People with brain injury lack awareness of the impact of their behaviour on others					✓
130	A person with brain injury is fully in control of their actions (N)					✓
131	A person with brain injury is in charge of their behaviour (N)	✓				
132	A person with brain injury is normally a social conformist, following social rules			✓		
133	People with brain injury routinely break social rules and norms (P)	✓				
134	Most people with brain injury are law abiding citizens (N)	✓				
135	People with brain injury are more likely to commit crimes (P)	✓				

136	People are responsible for their actions after brain injury (N)	✓				
137	Most people with brain injury do not carry out actions with clear intentions and	✓				
138	Negative and unwanted behaviours after brain injury are unintentional (P)			✓		
139	A person with brain injury lacks awareness and understanding of the					✓
Domain: Risk factors						
140	Many people with brain injury are at an increased risk of homelessness (P)					✓
141	A person who is homeless is at a greater risk of experiencing a brain					✓
142	Brain injury is unrelated to substance misuse issues (e.g. alcohol and drugs)			✓		
143	Brain injury increases the risk of using illegal substances (e.g. drugs) (P)					✓
144	Brain injury does not increase the risk of gambling problems occurring (N)			✓		
145	Financial strife after brain injury is commonplace (P)		✓			
146	Brain injury does not affect a person's ability to fit in as normal with their			✓		
147	The number and quality of social relations are not usually disrupted by			✓		
148	Most people with brain injury do not function independently (P)	✓				
Domain: Perceptions of motivation and effort						

149	If a person with brain injury is not getting better, they need to work harder (N)		✓			
150	A lack of progress after brain injury signifies a lack of effort (N)		✓			
151	How quickly a person with brain injury recovers does not depend on how	✓				
152	After a brain injury, working hard speeds up the rate at which a person recovers (N)	✓				
153	A person with brain injury has full control and power over their symptoms (N)		✓			
154	After brain injury, it is up to the person whether they get better or worse (N)		✓			
155	The course of recovery after brain injury is not affected by how motivated the	✓				
156	Nothing a person does will affect their recovery or outcome after brain injury (P)			✓		
157	A person with brain injury has limited power to influence and control its effects	✓				
Domain: Understanding changes in mood after brain injury						
158	High levels of anxiety are common after brain injury (P)		✓			
159	Brain injury can affect a person's mood (P)		✓			
160	The effects of brain injury can lead a person to feel a range of negative emotions		✓			
161	The likelihood of depression does not increase after brain injury (N)					✓
162	Depression occurs infrequently after brain injury (N)			✓		

163	Compared to the general population, rates of depression are no different in					✓
164	Feeling sad or hopeless after brain injury is common (P)		✓			
165	Getting angry easily and quickly is not normally associated with brain injury (N)					✓
166	Rapid changes in temperament are common after brain injury (P)		✓			
167	Impulsive behaviour is common after brain injury (P)		✓			
168	After brain injury, many people can successfully moderate their own behaviour	✓				
169	Many people with brain injury have good control over their mood and			✓		
170	People with brain injury often feel easily frustrated when they struggle to carry		✓			
171	It is common for people with brain injury to experience rapid changes in their		✓			
172	Mood and behaviour is stable and unchanging after brain injury (N)	✓				
Domain: Distractor items						
173	Heart defects and palpitations are common after brain injury	✓				
174	Shortness of breath and breathing difficulties (e.g. asthma) are far more	✓				
175	Arthritis and rheumatoid conditions frequently appear shortly after		✓			
176	People with brain injury commonly experience increased urination	✓				

177	The risks of allergic reactions occurring increase after brain injury	✓				
178	People with brain injury commonly experience rashes and burning skin (i.e.	✓				
179	Itchy, red and watering eyes are common symptoms after brain injury		✓			
180	A person with brain injury is more likely to suffer from repeated chest	✓				
181	Extremes in thirst and hunger are normal consequences for a person after brain	✓				
182	It is common for people with brain injury to experience paranoid thoughts	✓				
183	Expressing delusional ideas is not normally associated with brain injury	✓				
184	Engaging in repetitive movements (e.g. hand flapping, finger twisting, rocking back	✓				
185	After brain injury, a person might noticeably avoid eye contact with, or gaze	✓				
186	Most people after brain injury experience delusions and hallucinations		✓			
187	Persistent, unwanted and unpleasant thoughts are common after brain injury	✓				
188	After brain injury, a person is more likely to fear contamination by germs	✓				
189	After brain injury, it is normal for a person to worry excessively about their physical	✓				
190	A need for orderliness is common after brain injury	✓				
New item developed after pilot study						

191	After brain injury, behaviour is often rational and intentional			✓		
Attentional controls						
191	Select option 'definitely true’					✓
192	Select option 'probably true’			✓		
193	Select option ‘possibly true’			✓		
194	Select option ‘uncertain;					✓
195	Select option ‘possibly false’			✓		
196	Select option ‘probably false’			✓		
197	Select option ‘ definitely false’					✓

Appendix B

Chapter 3 Pilot Study: Ethical Approval Letter 0333

31 January 2019

Dear ELEANOR BRYANT, , , CLAIRE Williams, Ruth HORRY,

Re: 0333 , Development of a perception measure of brain injury

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee.

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted]).

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr IRENE Reppa (Reviewer of Application)

Associate Professor Andrew Kemp (Committee Chair)

Appendix C

Chapter 3: Pilot Study Demographic and Professional Experience Questions

Q1: What is your age in years?

Q2: What is your gender?

- Male
- Female
- Other gender identity
- Prefer not to say

Q3: What is your ethnic background?

- White
- Mixed/ Multiple ethnic groups
- Asian/ Asian Black
- Black / African / Caribbean / Black British
- Chinese
- Arab
- Other ethnic group
- Prefer not to say

Q4: What is your highest level of education?

- No formal education
- Secondary/ High School
- College/ Sixth Form
- University (e.g., BA/BSc/Degree)
- Masters
- Phd/ Doctorate
- Other

If other, please specify below

Professional experience questions

Q5: What is your current occupation?

- Consultant psychologist
- Psychiatrist
- Psychologist
- Occupational Therapist
- Speech and language therapist
- Nurse
- Case Manager
- Volunteer
- Support worker
- Academic
- Assistant Psychologist
- Other

If other, please specify below

Q6: What type of setting do you work in?

Please select from the list, if your role covers more than one field, please select the one which describes where the majority of your working role is carried out.

1. Impatient Neurorehabilitation
2. Community based rehabilitation
3. Therapy services
4. Charitable organisation
5. Academic
6. Other

If other, please specify below

Q7: Have you worked directly with individuals with brain injury?

- Yes
- No

(Qualtrics set up, if no: skip question 8-9)

Q8: How many years or months have you spent working with individuals with brain injury?

(Please indicate whether this is years or months in your answer e.g. 2 months or 2 years)

Q9: Please approximate the percentage of time your working role involves working with individuals with brain injury?

- Less than 20%
- 21-40%
- 41-60%
- 61-80%
- 81-100%

Appendix D

Brain Injury Attribution Scale (BIAS) - All Items

We are interested in your understanding and perceptions of brain injury. Please read the following statements and rate your level of agreement with each statement. Please answer the questions as best you can.

Scaling: Agree/ Disagree response format 1= Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 =
Neither agree nor disagree, 5 = Somewhat agree, 6 = Agree, 7 = Strongly agree

Item Number	**Item**	**Removed**		**Retained**
Domain: Empathy		**Phase 2 Screening**	**EFA**	
1	People with brain injury deserve understanding from those around them	✓		
2	If I met someone with a brain injury, I would feel sympathy for them (P)	✓		
3	A brain injury is traumatic for the person concerned (P)	✓		
4	The thought of a person suffering after brain injury upsets me (P)	✓		
5	People with brain injury don't deserve pity from those around them (N)		✓	
6	If I knew someone with a brain injury, I would not feel particularly worried			✓
7	People with brain injury deserve what happened to them (N)	✓		
8	A person with brain injury deserves to lose their friends and loved ones after their injury (N)	✓		
9	I feel sorry for people with brain injury (P)	✓		
10	The misfortune of people with brain injury has no emotional effect on me			✓
11	I would find it upsetting to observe someone with a brain injury (P)			✓
12	I would have a strong urge to help someone with a brain injury			✓

13	The unhappiness or distress of a person with brain injury would not be			✓
14	I would find it difficult to empathise with the hopes and needs of people		✓	
Domain: Social inclusion				
15	I would feel reluctant to strike up a conversation with someone with a			✓
16	I would attend a social occasion or party if someone with a brain injury	✓		
17	I would be willing to work in the same office as someone with a brain injury	✓		
18	If a friend suffered a brain injury, I would be willing to continue our	✓		
19	I would feel uncomfortable being friends with a person who has a brain			✓
20	People with brain injury should not be excluded from societal and		✓	
21	People with brain injury should not be treated differently to others in the		✓	
22	I would not knowingly treat a person with brain injury differently in the		✓	
23	It is wrong to shy away from people with brain injury (P)		✓	
24	I would not want to live in close proximity to a person with brain	✓		
25	I would not want to socialise with someone if they had a brain injury (N)	✓		
26	I would not knowingly be friends with a person with brain injury (N)	✓		
27	I would feel unsure about mixing and interacting with someone with a brain			✓
28	If I were a landlord, I would be reluctant to rent my house to a person			✓
29	I would be happy for a person with brain injury to be employed at my	✓		
Domain: Helping behaviour				
30	People with brain injury should have access to the best medical care	✓		
31	People with brain injury should not have access to the same standard of	✓		
32	People with brain injury do not deserve help from others (N)	✓		

33	People with brain injury should receive specialist rehabilitation	✓		
34	I would certainly help someone with a brain injury (P)	✓		
35	Society provides enough support for people with brain injury (N)		✓	
36	I would probably help someone with a brain injury, even if they weren’t		✓	
37	People with brain injury deserve all the care and support they need to get	✓		
38	Plenty of information and resources are available to help people with brain		✓	
39	People with brain injury should be given all the support they need to	✓		
40	Caring for people with brain injury should be seen as a priority in relation		✓	
41	Society should place equal importance on the care of people with brain injury	✓		
42	People with brain injury place a burden on healthcare resources that	✓		
43	People with brain injury use scarce resources that could be better used to	✓		
Domain: Blame				
44	People with brain injury are generally to blame for their injury (N)	✓		
45	Brain injury often results from the person’s own actions and behaviour		✓	
46	Most brain injuries occur through no fault of the person concerned (P)		✓	
47	Typically, a person is responsible for their brain injury (N)	✓		
48	People with brain injury have no one to blame but themselves (N)	✓		
49	Typically, the cause of brain injury cannot be controlled (P)		✓	
50	A person should be held more responsible for their behaviour if their		✓	
51	A person with brain injury should be considered responsible for their		✓	
Domain: Trustworthiness				
52	Most people with brain injury will exaggerate their symptoms for	✓		

53	Most people with brain injury will exaggerate the effects of their injury	✓		
54	People with brain injury often embellish their symptoms to gain	✓		
55	People commonly use their brain injury to excuse their general			✓
56	People with brain injury can be trusted to tell the truth about the severity of		✓	
57	People with brain injury use their symptoms as a reason for treating	✓		
58	Symptom exaggeration after brain injury is uncommon (P)			✓
59	Generally speaking, people with brain injury do not overstate their symptoms			✓
60	Typically, people with brain injury do not use their symptoms for personal			✓
61	People commonly use their brain injury as a reason to avoid their	✓		
62	A brain injury is often just an excuse to avoid commitments (e.g. work,	✓		
63	A person with brain injury can be trusted to give a genuine account of		✓	
Domain: <u>Fear and avoidance</u>				
64	People with brain injury are a danger to other people (N)	✓		
65	People with brain injury pose a threat to others (N)			✓
66	I would feel unsafe in the presence of someone with brain injury (N)	✓		
67	The thought of living nearby to a person with brain injury terrifies me	✓		
68	Meeting someone with a brain injury wouldn't scare or frighten me (P)			✓
69	People with brain injury are dangerous and pose a risk to society (N)			✓
70	I would avoid someone if I knew they had a brain injury (N)	✓		
71	People with brain injury are unpredictable and should be avoided	✓		
72	People with brain injury are unlikely to be a danger to themselves or others			✓
73	People with brain injury should not be allowed to live independently in the		✓	

74	People with brain injury pose no risk to other people (P)			✓
75	People with brain injury are no more dangerous than anyone else (P)			✓
76	There is no need to avoid people with brain injury (P)	✓		
77	There is no need to be frightened of people with brain injury (P)			✓
Attentional Control Checks				
78	Strongly disagree			✓
79	Disagree		✓	
80	Somewhat disagree		✓	
81	Neither agree nor disagree			✓
82	Somewhat agree		✓	
83	Agree		✓	
84	Strongly Agree		✓	

Appendix E

THE MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE (SDS)

Crowne and Marlow, 1960

[redacted]

[redacted]

Source: Crowne, D.P., and Marlow, D.A. (1960). A new scale of social desirability independent of pathology. *Journal of Consulting Psychology,* 24: 351.

Appendix F

Levels of Contact: - Ranked Version
(adapted from Holmes et al., 1999)

Instructions: Please read each of the following statements carefully. After you have read all the statements below, place a check by the statements that best depict your exposure to persons with a brain injury.

[redacted]

Appendix G
Ethical Approval Letter 0338

19 March 2019

Dear Ms ELEANOR BRYANT, , , CLAIRE Williams, Ruth HORRY,

Re: 0338 , Development of a new perception measure of brain injury: an exploration of its psychometric properties

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee.

The list of additional students (if any) are included in the table below:

Other student applicant - first name	Other student applicant - Surname	Other student applicant - email

additional researcher or student - first name	additional researcher or student - surname	additional researcher or student - email

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted].

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr Ceri Bradshaw (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix H

Standard Demographic Questions

Q1 What is your age in years?

[ ]

Q2: What is your gender?

- Male
- Female
- Other gender identity
- Prefer not to say

Q3: What is your ethnic background?

- White/ Caucasian
- Mixed/ Multiple ethnic groups
- Asian (East and South)
- Black / African American / Caribbean / Black British
- Latino/ Hispanic
- Middle Eastern
- White / Sephardic Jew
- African
- Other ethnic group
- Prefer not to say

  If other, please specify below

[ ]

Q4: What is your highest level of education?

- No formal education
- Secondary/ High School
- College/ Sixth Form
- University (e.g., BA/BSc/Degree)
- Masters
- Phd/ Doctorate
- Other

If other, please specify below

Q5. What is your employment status?

- Full-time employment
- Part-time employment
- Unemployed as unable to work (disability; health related reason) (if ticked skip Q7)
- Currently unemployed but looking for work (if ticked skip Q7)
- Retired (if ticked skip Q7)
- Unpaid Family Work / Homemaker / Carer (if ticked skip Q7)
- Full-Time Student (if ticked skip Q7)
- Part-Time Student (if ticked skip Q7)
- Unpaid voluntary work (not working or seeking work) (if ticked skip Q7)

Q7. What is your current role title / occupation (please be as specific as possible e.g. teacher / administrator/ manager?

Q8: What is your country of residence?

1. United Kingdom
2. United States of America
3. Canada
4. Poland
5. Portugal
6. Italy
7. Germany
8. Austria
9. Spain
10. Mexico
11. Other

If other, please state your country of residence.

Appendix I

Chapter 3: SDS Correlations with PBIM Items

PBIM	Pearson's Correlations
Having one brain injury increases the chances of having another	0.09
Brain injury can occur without a direct blow to the head	-0.01
A brain injury as a result from a road traffic incident is typically more serious than a brain injury from a fall	0.07
A brain injury acquired in childhood has less of an impact than a brain injury acquired from a fall	0.08
Penetrating forms of brain injury are more severe than non-penetrating forms	0.00
Some degree of brain damage is probably fine, as we only use 10% of our brain anyway	0.13
Chronic physical health conditions are more debilitating for a person than brain injury (e.g. diabetes, heart disease)	0.03
Evidence of brain injury is always detectable from a brain scan	0.08
An abnormal brain scan is needed to confirm the presence of brain injury	0.08
There’s not much difference between a brain injury and mental illness	0.04
Brain injury mostly affects memory, but in other ways a person can be completely normal	0.01
Having to use a wheelchair on a daily basis because of a disability indicates a more debilitating condition than brain injury	-0.03
A physical disability (e.g. using a wheelchair / mobility aid) is more debilitating than a brain injury	0.05
You can tell if someone has a brain injury by the way they look	0.02
The severity of brain injury is lessened from being intoxicated at the time of injury	0.01

If brain injury occurs when someone is intoxicated, its impacts are lessened	0.00
It is not always easy to tell if someone has sustained a brain injury	0.02
The effects of brain injury are often hidden and/or invisible	-0.07
Walking down a street, it would be difficult to identify someone with a brain injury by the way they were acting, talking and/ or moving	-0.05
The effects of brain injury are permanent	0.02
The effects of brain injury become more noticeable over time	-0.03
A complete recovery after brain injury is unlikely, even if the person tries hard to get better	0.02
The full effects of brain injury become apparent over time	0.00
The impact of childhood brain injury can take years to become apparent	0.05
A person is unlikely to return to their normal self after a brain injury	0.00
The effects of brain injury are often insignificant and unremarkable	0.07
The symptoms of brain injury improve at a steady rate	0.07
The effects of brain injury are temporary and short lived	0.08
A person with brain injury can easily exaggerate their symptoms	-0.11
Anyone can easily mimic the effects of brain injury	0.04
The primary goal of brain injury rehabilitation is to improve physical functioning	0.10
Once discharged from acute care, a full recovery has been achieved	0.11
Once a good physical recovery has been achieved, the person is 100% better	0.04
Physical, memory and social recovery occur at the same rate following brain injury	0.08
Recovery after brain injury is focused on achieving good physical outcomes	0.10
Physical recovery from brain injury is a good indicator of overall recovery	0.07
The effects of brain injury often resolve within a few months	0.04
A person with brain injury often recovers fully within a few weeks	0.05
The effects of brain injury are stable over time	0.02

Concussion can occur without a loss of consciousness (e.g. being knocked out)	0.03
The impact of concussion is cumulative (the impact becomes greater with each individual concussion)	0.02
The more concussions you experience, the more damaging they become	0.02
The severity of brain injury increases with each additional concussion	-0.01
A concussion is normally harmless	0.05
Brain Injury always involves a loss of consciousness	0.06
After a coma, most people wake up completely normal	0.08
The effects of concussion are short-lived	0.04
It is not possible to have a serious brain injury without losing consciousness	0.05
Changes in a person’s personality are uncommon after brain injury	0.03
Decision making is not typically affected by brain injury	0.08
Behavioural problems are uncommon after a brain injury	0.01
Brain injury rarely results in serious consequences	-0.07
Families don’t often see many changes in their loved ones’ behaviour after brain injury	0.02
People with brain injury are good at planning and organising their daily lives	0.09
Brain injury does not affect a person’s ability to organise and plan activities	0.04
Sleeping difficulties are uncommon after brain injury	0.02
Alcohol affects a person differently after brain injury	0.02
The effects of alcohol are often more pronounced after brain injury	0.09
People are more distractible after brain injury	0.06
Joining group conversations can be difficult after brain injury	0.04
Brain injury affects a person’s ability to empathise with the emotional needs of others	0.03
People with brain injury find it difficult to inhibit their behaviour	0.13
People with brain injury are often unaware of any changes in themselves	0.01

Having a brain injury increases the likelihood of getting into trouble with the law	0.06
Losing your sense of role and purpose in life is not normally a consequence of brain injury	0.05
The ability to respond appropriately to social cues and situations is unaffected by brain injury	0.10
Returning to work after brain injury is commonplace	0.04
People with brain injury have a good understanding of the impact of their brain injury on themselves and others	0.02
A person with brain injury best understands the consequences of their injury on themselves and others	0.08
The effects (if any) of brain injury are obvious to the person with brain injury	0.06
Most people have a clear picture and understanding of how their brain injury may have affected them	0.08
People with brain injury find it difficult to adapt to the consequences (if any) of their brain injury	0.05
In general, the consequences of brain injury are not well understood	0.09
People with brain injury lack awareness of the impact of their behaviour on others	-0.01
Harmful behaviour and actions after brain injury are typically unintentional	-0.06
A person with brain injury lacks awareness and understanding of the consequences of their actions	-0.02
A person with brain injury is fully in control of their actions	-0.02
A person with brain injury is normally a social conformist, following social rules and norms	0.03
After brain injury, behaviour is often rational and intentional	0.04
Many people with brain injury are at an increased risk of homelessness	0.16
A person who is homeless is at a greater risk of experiencing a brain injury	0.14
Brain injury increases the risk of using illegal substances (e.g. drugs)	0.12

The number and quality of social relations are not usually disrupted by brain injury	0.04
Brain injury is unrelated to substance misuse issues (e.g. alcohol and drugs)	0.08
Brain injury does not affect a person's ability to fit in as normal with their social peers	0.11
Brain injury does not increase the risk of gambling problems occurring	0.03
After brain injury, it is up to the person whether they get better or worse	0.07
Nothing a person does will affect their recovery or outcome after brain injury	0.07
If a person with brain injury is not getting better, they need to work harder	0.01
The likelihood of depression does not increase after brain injury	0.04
Depression occurs infrequently after brain injury	0.04
Compared to the general population, rates of depression are no different in people with brain injury	0.10
Getting angry easily and quickly is not normally associated with brain injury	-0.03
Many people with brain injury have good control over their mood and temperament	0.00

Appendix J

Chapter 3: Correlations between SDS Total Scores and BIAS Items

BIAS Items	Pearson's Correlations
People with brain injury don't deserve pity from those around them	-0.01
If I knew someone with a brain injury, I would not feel particularly worried or concerned for them	0.03
The misfortune of people with brain injury has no emotional effect on me	-0.09
The unhappiness or distress of a person with brain injury would not be especially moving for me	-0.02
I would find it difficult to empathise with the hopes and needs of people with brain injury	-0.08
I would find it upsetting to observe someone with a brain injury	0.05
I would have a strong urge to help someone with a brain injury	-0.19
I would feel reluctant to strike up a conversation with someone with a brain injury	-0.03
I would feel uncomfortable being friends with a person who has a brain injury	-0.06
I would feel unsure about mixing and interacting with someone with a brain injury	-0.03
If I were a landlord, I would be reluctant to rent my house to a person with brain injury	-0.08
People with brain injury should not be excluded from societal and community activities	0.00
People with brain injury should not be treated differently to others in the community or workplace environment	-0.02
I would not knowingly treat a person with brain injury differently in the community or workplace environment	0.03
It is wrong to shy away from people with brain injury	-0.07
Society provides enough support for people with brain injury	0.05
Plenty of information and resources are available to help people with brain injury	0.08
I would probably help someone with a brain injury, even if they weren’t putting much effort into helping themselves	-0.12

Caring for people with brain injury should be seen as a priority in relation to other health conditions	-0.12
Most brain injuries occur through no fault of the person concerned	0.01
Typically, the cause of brain injury cannot be controlled	-0.03
Brain injury often results from the person's own actions and behaviour	0.02
A person should be held more responsible for their behaviour if their actions caused the brain injury in the first place	-0.03
A person with brain injury should be considered responsible for their behaviour, irrespective of how they acquired their injury	0.10
People commonly use their brain injury to excuse their general behaviour and manner	-0.04
People with brain injury can be trusted to tell the truth about the severity of their symptoms	-0.07
Symptom exaggeration after brain injury is uncommon	-0.03
Generally speaking, people with brain injury do not overstate their symptoms to get ‘an easier ride out of life’	-0.07
Typically, people with brain injury do not use their symptoms for personal benefit	-0.01
A person with brain injury can be trusted to give a genuine account of the effects of their injury	-0.13
Meeting someone with a brain injury wouldn’t scare or frighten me	-0.02
People with brain injury are unlikely to be a danger to themselves or others	0.00
People with brain injury pose no risk to other people	-0.09
People with brain injury are no more dangerous than anyone else	-0.08
There is no need to be frightened of people with brain injury	-0.04
People with brain injury pose a threat to others	-0.02
People with brain injury are dangerous and pose a risk to society	0.01
People with brain injury should not be allowed to live independently in the community	-0.02

Appendix K

Chapter 4: Professional Sample (N= 74) – Professional Role/ Background

Professional Background/ Role	**n**	**%**
Academic	2	2.70
Assistant Psychologist	3	4.10
Charity	3	4.10
Care Coordinator	1	1.35
Case Manager	10	13.50
Clinical Administration	1	1.25
Clinical Psychologist	5	6.75
Consultant (e.g. neuropsychologist/ psychologist)	12	16.20
Counsellor	1	1.35
Director of Rehabilitation Services	2	2.70
Family Therapist	1	1.35
Nurse	3	4.10
Occupational Therapist	6	8.10
Physiotherapist	2	2.70
Registered Manager/ Service Manager	2	2.70
Service Manager	1	1.35
Social Worker	3	4.10
Solicitor / Legal Secretary	3	4.10
Speech and Language Therapist	4	5.45
Support Worker	7	9.45
Volunteer	2	2.70

Appendix L

Chapter 4: Professional Sample - Professional Experience questions

Initial screening question

Do you currently, or have you worked with individuals with brain injury?

- Yes
- No

What is your current primary occupation? (if retired, please state previous occupation)

- Consultant (e.g. neuropsychologist/ psychologist)
- Psychiatrist
- Clinical Psychologist
- Occupational Therapist
- Speech and language therapist
- Nurse
- Case Manager
- Volunteer
- Support worker
- Academic
- Assistant Psychologist
- Other

If other, please specify below

If you hold multiple roles, please state your other roles here?

How many years or months have you been working in your current role / or previous role if retired?

(Please indicate whether this is years or months in your answer e.g. 2 months or 2 years)

What type of setting do you work in? (note if you are currently retired, please state your previous employment setting)

Please select from the list, if your role covers more than one field, please select the one which describes where the majority of your working role is carried out.

- Impatient Neurorehabilitation
- Community based rehabilitation
- Therapy services
- Charitable organisation
- Academic
- Other

If other, please specify below

Across your working life, how many years or months in total have you spent working with individuals with brain injury?

(Please indicate whether this is years or months in your answer e.g. 2 months or 2 years)

Appendix M

Chapter 4: Correlations between SDS and the PBIM and BIAS Measures

Measure BIAS	Person's Correlations
1. I would feel unsure about mixing and interacting with Someone with a brain injury	-0.24
2. I would feel reluctant to strike up a conversation with someone with a brain injury	-0.17
3. If I were a landlord, I would be reluctant to rent my house to a person with brain injury	-0.12
4. Meeting someone with a brain injury wouldn't scare or frighten me	0.01
5. I would feel uncomfortable being friends with a person who has a brain injury	-0.09
6. There is no need to be frightened of people with brain injury	-0.12
7. The misfortune of people with brain injury has no emotional effect on me	-0.05
8. The unhappiness or distress of a person with brain injury would not be especially moving for me	-0.09
9. I would find it upsetting to observe someone with a brain injury	0.11
10. If I knew someone with a brain injury, I would not feel particularly worried or concerned for them	0.08
11. I would have a strong urge to help someone with a brain injury	-0.20
12. Symptom exaggeration after brain injury is uncommon	-0.08
13. Typically, people with brain injury do not use their symptoms for personal benefit	-0.03
14. Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life'	-0.05
15. People commonly use their brain injury to excuse their general manner and behaviour	0.05
16. People with brain injury pose no risk to other people	-0.05
17. People with brain injury are dangerous and pose a risk to society	0.09
18. People with brain injury are no more dangerous than anyone else	-0.03
19. People with brain injury are unlikely to be a danger to themselves or others	-0.13
20. People with brain injury pose a threat to others	-0.07

PBIM

1. Anyone can easily mimic the effects of brain injury	0.01
2. Losing your sense of role and purpose in life is not normally a consequence of brain injury	-0.02
3. Sleeping difficulties are uncommon after brain injury	-0.05
4. Compared to the general population, rates of depression are no different in people with brain injury	0.07
5. The likelihood of depression does not increase after brain injury	0.04
6. Decision making is not typically affected by brain injury	0.08
7. Getting angry easily and quickly is not normally associated with brain injury	-0.03
8. A person with brain injury is fully in control of their actions	-0.08
9. Changes in a person's personality are uncommon after brain injury	-0.08
10. Physical, memory and social recovery occur at the same rate following brain injury	-0.03
11. A person with brain injury can easily exaggerate their symptoms	-0.01
12. The effects of brain injury are often insignificant and unremarkable	-0.12
13. Many people with brain injury are at an increased risk of homelessness	0.21
14. Brain injury increases the risk of using illegal substances (e.g., drugs)	0.14
15. Having a brain injury increases the likelihood of getting into trouble with the law	0.09
16. A person who is homeless is at a greater	0.00
17. The impact of concussion is cumulative (the impact becomes greater with each individual concussion)	0.02
18. The severity of brain injury increases with each additional concussion	-0.02
19. The more concussions you experience, the more damaging they become	-0.03
20. A concussion is normally harmless	-0.22
21. Having one brain injury increases the chances of having another	0.06
22. The impact of childhood brain injury can take years to become apparent	0.01
23. People with brain injury have a good understanding of the impact of their brain injury on themselves and	-0.02
24. Most people have a clear picture and understanding of how their brain injury may have affected them	-0.03
25. A person with brain injury best understands the consequences of their injury on themselves and others	-0.02
26. A person with brain injury lacks awareness and understanding of the consequences of their actions	0.06

27. People with brain injury lack awareness of the impact of their behaviour on others	0.01
28. The effects (if any) of brain injury are obvious to the person with brain injury	-0.04
29. A complete recovery after brain injury is unlikely, even if the person tries hard to get better	-0.05
30. The effects of brain injury are permanent	-0.12
31. Returning to work after brain injury is commonplace	0.05
32. A person is unlikely to return to their normal self after a brain injury	0.01
33. Physical recovery from brain injury is a good indicator of overall recovery	-0.03
34. Evidence of brain injury is always detectable from a scan	0.14
35. Recovery after brain injury is focused on achieving good physical outcomes	0.02
36. The primary goal of rehabilitation is to improve physical functioning	-0.14
37. Brain injury mostly affects memory, but in other ways a person can be completely normal	-0.01

Appendix N

Comparisons between Professional and Layperson Samples: Odds Ratios for PBIM36

PBIM36	OR
PBIM36 total score	1.09
Signs and symptoms of brain injury	1.20
Social determinants and consequences of brain injury	1.27
Severity and impact of brain injury	1.16
Insight	1.25
Permanence of brain injury	1.26
Physical and medical expectations	1.26

Appendix O

Perception of Brain Injury Measure – 36 items (PBIM36)

We are interested in your understanding and perceptions of brain injury. Please read the following statements and rate how true or how false you consider each statement. Please answer the questions as best you can.

1. Anyone can easily mimic the effects of brain injury (F)
2. Losing your sense of role and purpose in life is not normally a consequence of brain injury (F)
3. Sleeping difficulties are uncommon after brain injury (F)
4. Compared to the general population, rates of depression are no different in people with brain injury (F)
5. The likelihood of depression does not increase after brain injury (F)
6. Decision making is not typically affected by brain injury (F)
7. Getting angry easily and quickly is not normally associated with brain injury (F)
8. A person with brain injury is fully in control of their actions (F)
9. Changes in a person’s personality are uncommon after brain injury (F)
10. Physical, memory and social recovery occur at the same rate following brain injury (F)
11. A person with brain injury can easily exaggerate their symptoms (F)
12. The effects of brain injury are often insignificant and unremarkable (F)
13. Many people with brain injury are at an increased risk of homelessness (T)
14. Brain injury increases the risk of using illegal substances (e.g. drugs) (T)
15. Having a brain injury increases the likelihood of getting into trouble with the law (T)
16. A person who is homeless is at a greater risk of experiencing a brain injury (T)
17. The impact of concussion is cumulative (the impact becomes greater with each individual concussion) (T)
18. The severity of brain injury increases with each additional concussion (T)
19. The more concussions you experience, the more damaging they become (T)
20. A concussion is normally harmless (F)
21. Having one brain injury increases the chances of having another (T)
22. The impact of childhood brain injury can take years to become apparent (T)
23. People with brain injury have a good understanding of the impact of their brain injury on themselves and others (F)
24. Most people have a clear picture and understanding of how their brain injury may have affected them (F)

25 A person with brain injury best understands the consequences of their injury on themselves and others (F)
26 A person with brain injury lacks awareness and understanding of the consequences of their actions (T)
27 People with brain injury lack awareness of the impact of their behaviour on others (T)
28 The effects (if any) of brain injury are obvious to the person with brain injury (F)
29 A complete recovery after brain injury is unlikely, even if the person tries hard to get better (T)
30 The effects of brain injury are permanent (T)
31 A person is unlikely to return to their normal self after a brain injury (T)
32 Physical recovery from brain injury is a good indicator of overall recovery (F)
33 Evidence of brain injury is always detectable from a brain scan (F)
34 Recovery after brain injury is focused on achieving good physical outcomes (F)
35 The primary goal of brain injury rehabilitation is to improve physical functioning (F)
36 Brain injury mostly affects memory, but in other ways a person can be completely normal (F)
37 Select option: Definitely true
38 Select option: Uncertain
39 Select option: Definitely false

Response format

Items are scored on 7-point False- True scale with the following response options 1 = Definitely False, 2 = Probably False, 3 = Possibly False, 4 = Uncertain, 5 = Possibly True, 6 = Probably True, 7 = Definitely True

Scoring of the PBIM total and subscale scores

The subscale items are summed to produce subscale scores. A total score is calculated by summing the subscale scores. More accurate knowledge of brain injury is indicated by a higher score on the PBIM.

PBIM subscale	**Number of items**	**Item numbers**
Symptoms of brain injury	12	1 (r), 2 (r), 3 (r), 4 (r), 5 (r), 6 (r),7 (r), 8 (r), 9 (r), 10 (r), 11 (r), 12 (r)
Social Determinants and Consequences of Brain Injury	4	13, 14, 15, 16
Severity and impact of brain injury	6	17, 18, 19, 20 (r), 21, 22
Insight	6	23 (r), 24 (r), 25 (r), 26, 27, 28 (r),
Permanence of brain injury	3	29, 30, 31
Physical and medical expectations	5	32 (r), 32 (r), 33 (r), 34 (r), 35 (r), 36 (r),
Attentional control check	3	37, 38, 39

Reverse scoring: *r* indicates that the item is reverse scored.

Appendix P

Brain Injury Awareness Scale – 20 item scale (BIAS-20)

We are interested in your understanding and perceptions of brain injury. Please read the following statements and rate your level of agreement with each statement. Please answer the questions as best you can

1	I would feel unsure about mixing and interacting with someone with a brain injury (N)
2	I would feel reluctant to strike up a conversation with someone with a brain injury (N)
3	If I were a landlord, I would be reluctant to rent my house to a person with brain injury (N)
4	Meeting someone with a brain injury wouldn't scare or frighten me (P)
5	I would feel uncomfortable being friends with a person who has a brain injury (N)
6	There is no need to be frightened of people with brain injury (P)
7	The misfortune of people with brain injury has no emotional effect on me (N)
8	The unhappiness or distress of a person with brain injury would not be especially moving for me (N)
9	I would find it upsetting to observe someone with a brain injury (P)
10	If I knew someone with a brain injury, I would not feel particularly worried or concerned for them (N)
11	I would have a strong urge to help someone with a brain injury (P)
12	Symptom exaggeration after brain injury is uncommon (P)
13	Typically, people with brain injury do not use their symptoms for personal benefit (P)
14	Generally speaking, people with brain injury do not overstate their symptoms to get 'an easier ride out of life' (P)
15	People commonly use their brain injury to excuse their general behaviour and manner(N)
16	People with brain injury pose no risk to other people (P)
17	People with brain injury are dangerous and pose a risk to society (N)

18	People with brain injury are no more dangerous than anyone else (P)
19	People with brain injury are unlikely to be a danger to themselves or others (P)
20	People with brain injury pose a threat to others (N)
21	Neither agree nor disagree
22	Disagree

Note: N = negatively worded item, P = positively worded item

Response format

Items are scored on 7-point Disagree to Agree scale with the following response options 1= Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Agree, 7 = Strongly Agree

Scoring of the BIAS total and subscale scores

The subscale items are summed to produce subscale scores. A total score is calculated by summing the subscale scores. A More positive attitude towards brain injury is indicated by a higher score on the BIAS.

BIAS subscale	**Number of items**	**Item numbers**
Social Inclusion	6	1 (r), 2 (r), 3 (r), 4, 5 (r), 6,
Empathy	5	7 (r), 8 (r), 9, 10 (r), 11
Genuineness	4	12, 13, 14, 15 (r)
Risk and Dangerousness	5	16, 17 (r), 18, 19, 20 (r)
Attentional control check	2	21, 22

Reverse scoring: *r* indicates that the item is reverse scored.

Appendix Q

Chapter 5: Summary of Demographic Characteristics for the Subset of Professional Sample who Completed the BIAS (n= 75)

Demographic characteristics	**Professional Sample (n = 75)**	
	n	*%*
Gender		
Male	16	21.3%
Female	59	78.7%
Other gender identity	-	-
Prefer not to say	-	-
Ethnicity		
White	70	93.3%
Multiple ethnic groups	1	1.3%
Asian	1	1.3%
Black	1	1.3%
Latino/Hispanic	1	1.3%
Middle Eastern	1	1.3%
White/ Sephardic Jew	-	-
Other or prefer not to say	-	-
Educational attainment		
Secondary School	4	5.3%
Sixth form/ college	4	5.3%
First degree	28	37.3%
Master’s degree	17	22.7%

PhD/ Doctorate	19	25.3%
Other	3	4.0%
Employment status		
Full time employment	57	76.0%
Part-time employment	16	21.3%
Retired	-	-
Unpaid carer	-	-
Not working due to disability/health reasons	-	-
Actively seeking employment	1	1.3%
Volunteer	1	1.3%
Full time student	-	-
Part-time student	-	-
Country of residence		
Australia	2	2.7%
Canada	1	1.3%
Ireland	_	_
India	-	-
Mexico	1	1.3%
Netherlands	1	1.3%
Nigeria	-	-
United Kingdom	70	93.3%
USA	-	-

Appendix R

Fictional Magistrates' Sentencing Remarks

Experiments 1 - 3

Page:

You are about to read the details of a fictional transcript of a magistrate sentencing a defendant in a court of law in the United Kingdom. The magistrate is talking directly to the defendant who has been charged with assault. The defendant is a 23-year-old male who has pleaded guilty to assaulting a 26-year-old male victim.

Please make sure that you are somewhere quiet and free of distractions, and that you have at least 15 minutes to read the materials and complete the survey.

Each screen has been set on a timer, which means that you will not be able to proceed to the next screen until a minimum amount of time has passed. Please take that time to read all of the information carefully.

Then, when you are ready to begin, please hit the arrow button.

Page: Magistrates summary overview (estimated reading time of 48 seconds – time set for is 24 seconds)

You have pleaded guilty to an offence of Assault Occasioning Actual Bodily Harm contrary to section 47 of Offences against the Person Act 1861. On the night of Saturday 25th May 2019, you were in a snooker club with two or your friends. An argument broke out between one of your friends and the victim, who was at the next snooker table. You joined the argument and after exchanging some angry words with the victim, you physically assaulted him.

At your first magistrates court appearance on July 15^{th}, 2019 you pleaded guilty to this offence. The case was subsequently adjourned for three weeks for a pre-sentence report to be prepared.

We have now heard all of the available evidence and have considered the information contained in your pre-sentence report, including an assessment of your personal circumstances and any aggravating and mitigating factors relevant to your case. We have considered all of this information carefully when deciding on your sentence.

Design note for Qualtrics: counterbalanced with mitigating factors in terms of order presentation.

Page: Magistrates summary – aggravating factors (estimated reading time is 45 seconds, time set is 23 seconds)

We have considered the following aggravating factors in your case.

- The assault did not stop after a single blow. You punched the victim three times in the face before being pulled away. Had you not been restrained, there is a strong possibility that you would have continued to physically assault the victim.
- Up until the point you assaulted the victim, he had not shown any physical aggression towards you. Therefore, we consider this to be an unprovoked attack. We note that the victim did not retaliate, and you sustained no physical injuries during the event.
- You caused significant harm to the victim. He suffered deeps cuts and bruises under his left eye which needed stitches, leaving permanent scarring. In addition, we also note that two of the victim’s front teeth were also broken during the assault and that he is receiving ongoing dental treatment to repair them.

Page: Mitigating factors (estimated reading time is 34 seconds, time set to 17 seconds)

We have considered the following mitigating factors in your case.

- We acknowledge that this is your first offence. You have no prior criminal record and we note that you have never been in trouble with the police before.
- You pleaded guilty to this offence at the earliest available opportunity, showing that you acknowledge the harm caused by your actions and that you accept that your actions were unlawful. Indeed, you have been co-operative with the police and probation services throughout the investigation.
- Your culpability for this offence is low. We acknowledge that this was a spontaneous incident - you did not go out with your friends that evening with the intention of causing harm.

Additional TBI Mitigating Factor

Experimental Condition:

TBI-no-physical – Experiment One / TBI-no-education – Experiment 2 / TBI-control – Experiment 3

- You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. We recognise that your brain injury may have contributed to your actions on the day of the assault.

Experiment 1: TBI physical ongoing condition

- You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. Since your injury, we are aware that you have been left with some mobility difficulties which require the daily use of a crutch, and on particularly bad days, a wheelchair. We recognise that your brain injury may have contributed to your actions on the day of the assault.

Experiment 1: TBI physical resolved condition

- You acquired a brain injury 14 months ago in a work-related incident. Since then, we understand that you now find it difficult to read social situations, have developed a tendency to act impulsively and make rash decisions. You also struggle to manage and control your emotions. Although fully resolved before the assault, we are aware that you were initially left with some mobility difficulties which required the daily use of a crutch, and on particularly bad days, a wheelchair. We recognise that your brain injury may have contributed to your actions on the day of the assault.

Educational Materials Presented in Experiments Two and Three

Video 1: (magistrates filler) played in:

Experiment Two: 1) no-TBI and TBI-no-education

Experiment Three: 1) TBI control

A video published by the HM Courts and Tribunals Service will be played to participants. The video is 1 minute 41 seconds long and is an animated video providing information about what happens when someone goes to a Magistrates' court.

Video link:

If this video does not start to play automatically, please press play.
https://www.youtube.com/watch?v=-hRTKMhxHoM&t=9s

(A timer will be set so that participants will not be able to continue until 105 seconds have passed)

Instructions to Participants

Now that you have read the aggravating and mitigating factors in this case, you will be presented with a video on the next page containing information about what you would expect to happen in a magistrates' court (followed by a page break).

…………………………………………..

Whilst you are watching this video, please do not leave this browser or click through to YouTube.

Video 2: TBI education (non-narrative) - played in Experiments Two and Three :

Experiment Two to TBI-education condition

Experiment Three to TBI-depersonalised-education condition

A video published by the Disabilities Trust will be played to participants. This video is 2 minutes 41 seconds long and is an animated video providing information about what happens to someone after they have sustained a traumatic brain injury.

Video link:
https://www.youtube.com/watch?time_continue=2&v=Gc2GKDeCKQI&feature=emb_logo

(A timer will be set so that participants will not be able to continue until 2 minutes and 45 seconds have passed)

Instructions to Participants

Now that you have read the aggravating and mitigating factors in this case, you will be presented with a video on the next page containing information about what happens to someone after they have sustained a traumatic brain injury (followed by a page break).

…………………………………………..

Whilst you are watching this video, please do not leave this browser or click through to youtube.

If this video does not start to play automatically, please press play.

Video 3 – TBI education (narrative) played in Experiment Three

Experiment Three to TBI-personalised-education condition A video

published by the Brain Injury Law Firm will be played to participants. The video is 3 minutes and 35 seconds long and is an animated video recounting the story of an individual who has experienced a TBI and the impact is has had on daily living.

Video link:
https://www.youtube.com/watch?v=nS0F_k4GT9Y (A timer will be set so that participants will not be able to continue until 3 minute and 35 seconds have passed)

Instructions to participants:

Now that you have read the aggravating and mitigating factors in this case, you will be presented with a video on the next page containing a personal story about a person who has experienced a traumatic brain injury (followed by a page break).

…………………………………………..

Whilst you are watching this video, please do not leave this browser or click through to YouTube.

If this video does not start to play automatically, please press play.

Page: Sentencing Guidelines

In the transcript that you have just read, the magistrate outlined the facts of this case. The next step is to sentence the defendant. The magistrate will begin at a standard starting point according to the sentencing guidelines set by the Sentencing Council in the United Kingdom. Then they will adjust the sentence taking into consideration the aggravating and mitigating factors that are unique to this individual case.

For the current offence, magistrates are able to impose the following sentences.

- A low-level community order (e.g., carrying out unpaid community service work which can range from 40-300 hours)
- A suspended custodial (prison) sentence of up to 26 weeks (the sentence will only be served if the defendant violates the conditions of the suspension during the suspended period which ranges from 6-24 months).
- A custodial (prison) sentence of up to 26 weeks
- Referral to the Crown Court for consideration beyond 26 weeks (up to a maximum of 51 weeks)

Magistrates’ Sentencing Verdict

Sentencing Verdict: Experiment One: Pilot Study One

“When deciding on your sentence, we have carefully weighed up the various mitigating and aggravating factors present in your case. Following our deliberations, we have reached the decision to send you to prison for a total period of 13 weeks for Assault Occasioning Actual Bodily Harm.”

Sentencing Verdict: Experiments One – Three

“When deciding on your sentence, we have carefully weighed up the various mitigating and aggravating factors present in your case.

Following our deliberations, we have reached the decision to send you to prison for a total period of 13 weeks for Assault Occasioning Actual Bodily Harm.

However, this sentence will be suspended on the condition that you are not convicted of another offence during the next 12 months.

If you adhere to the terms of your sentence, and commit no further offences in the next twelve months, you will not be required to serve your prison sentence.

However, if you break the terms of our sentence and are convicted of another offence while on your suspended sentence, you can expect to serve this prison sentence.”

Appendix S
Ethical Approval Letter 1534

14 October 2019

Dear Ms ELEANOR BRYANT, , , Dr CLAIRE Williams, Dr Ruth HORRY,

Re: 1534 , Decision making in the criminal justice system : pilot study

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee [redacted]

The list of additional students (if any) are included in the table below:

Other student applicant - first name	Other student applicant - Surname	Other student applicant - email

additional researcher or student - first name	additional researcher or student - surname	additional researcher or student - email

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted]

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr Menna Price (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix T

Histograms of Appropriateness of Sentencing Ratings

Pilot Study 1 Experiment 1

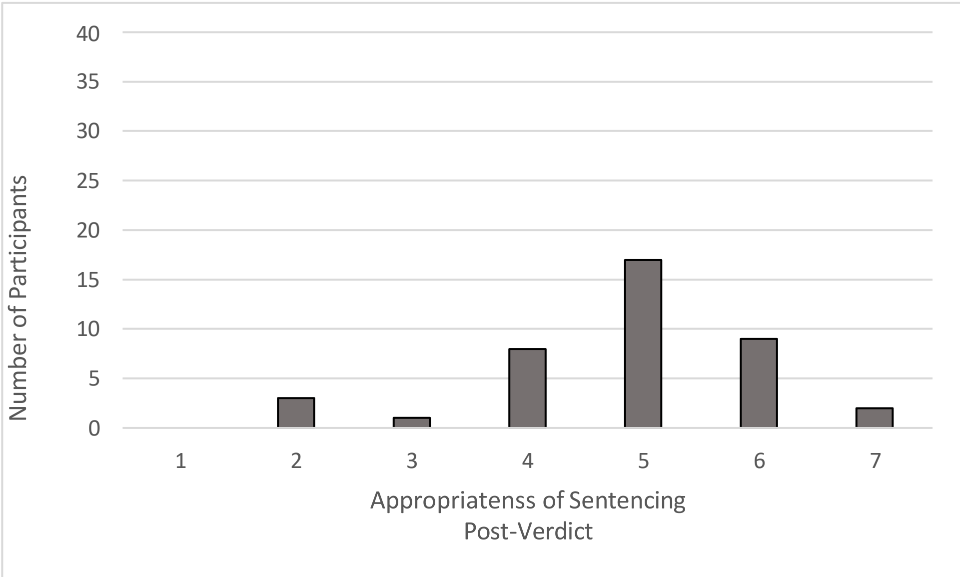

Figure 1 - Histogram of Appropriateness Sentencing Ratings - Post Verdict

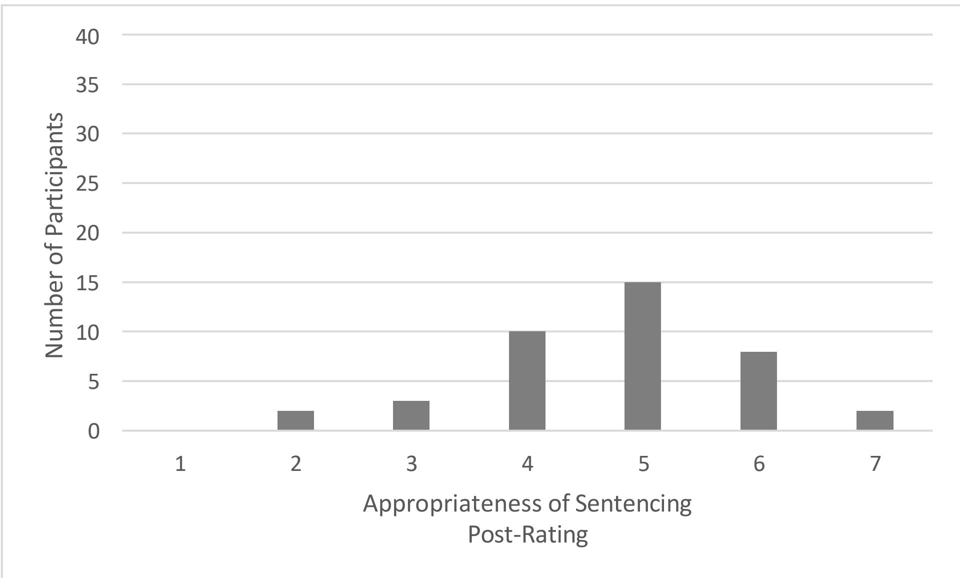

Figure 2 - Histogram of Appropriateness Sentencing Ratings - Post Rating

Appendix U

Histograms of Appropriateness of Sentencing Ratings

Pilot Study 2 Experiment 1

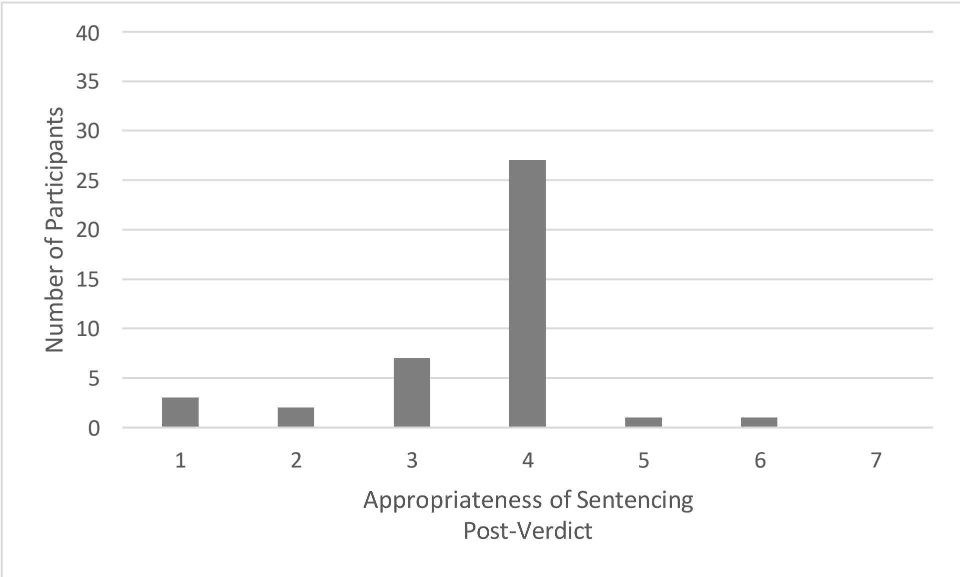

Figure 1 - Histogram of Appropriateness of Sentencing Ratings - Post-Verdict

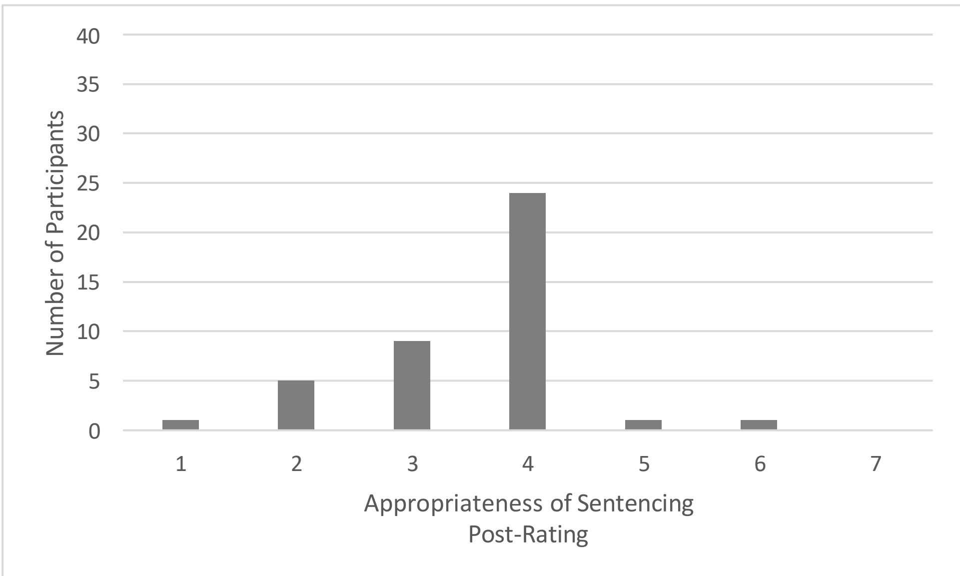

Figure 2 - Histogram of Appropriateness of Sentencing Ratings - Post-Rating

Appendix V

Juror Bias Scale (Kassin and Wrightsman, 1983)

[redacted]

Appendix W
Ethical Approval Letter 1529

25 November 2019

Dear Ms ELEANOR BRYANT, Dr CLAIRE Williams, Dr Ruth HORRY,

Re: 1529 , Decision making in the criminal justice system with defendants with brain injury

Your application - [redacted] as been reviewed and approved by the Department of Psychology Ethics Committee.

Please note, in order to comply with current standards it is important to include a Welsh language translation on the recruitment flyer and to also include a statement that the project has received ethical approval from the Department of Psychology Ethics Committee.

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted]

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr Daniel Zuj (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix X

Experiment One – Demographic Characteristics for Participant Sub-Set

Age: 18-74 (*M* = 28.53, *SD* = 12.07)

Demographic characteristics		**Sample (n=323)**	
		n	**%**
Gender			
	Male	58	18.0%
	Female	263	81.4%
	Other gender identity	2	0.6%
Ethnicity			
	White	290	89.8%
	Multiple ethnic groups	14	4.3%
	Asian	9	2.8%
	Black	3	0.9%
	Latino/Hispanic	1	0.3%
	Middle Eastern	2	0.6%
	Other or prefer not to say	4	1.2%
Educational attainment			
	No formal education	1	0.3%
	Secondary School	31	9.6%
	Sixth form/ college	134	41.5%
	First degree	117	36.2%
	Master’s degree	32	9.9%

PhD/ Doctorate	6	1.9%
Other	2	0.6%
Employment status		
Full time employment	68	21.1%
Part-time employment	60	18.6%
Retired	2	0.6%
Unpaid carer	18	5.6%
Not working due to disability/health reasons	6	1.9%
Actively seeking employment	16	4.6%
Volunteer	2	0.6%
Full time student	147	45.5%
Part-time student	5	1.5%
Country of residence		
Australia	2	0.6%
Canada	5	1.5%
Ireland	4	1.2%
Spain	1	0.3%
United Kingdom	298	92.3%
USA	13	4.0%

Appendix Y
Ethical Approval Letter 3870

17 April 2020

Dear Ms ELEANOR BRYANT, , , Dr CLAIRE Williams, Dr Ruth HORRY,

Re: 3870 , Decision making in the criminal justice system: study 2 pilot study

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee.

The list of additional students (if any) are included in the table below:

Other student applicant - first name	Other student applicant - Surname	Other student applicant - email

additional researcher or student - first name	additional researcher or student - surname	additional researcher or student - email

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted]

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr Menna Price (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix Z

Histograms of Appropriateness of Sentencing Ratings

Pilot Study – Experiment 2

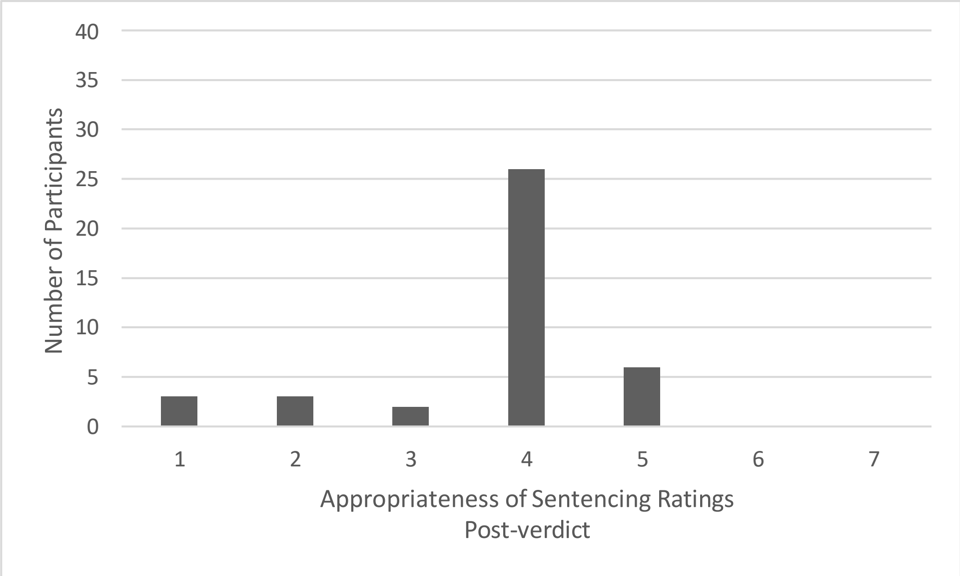

Figure 1 - Histogram of Appropriateness of Sentencing Ratings Post-verdict

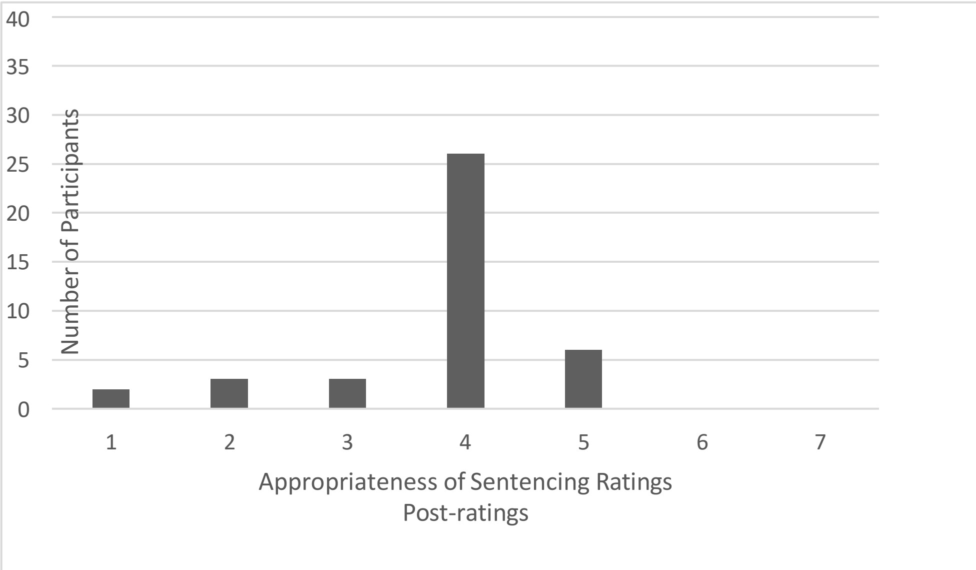

Figure 2 - Histogram of Appropriateness of Sentencing Ratings Post-ratings

Appendix AA

Experiment 2: Interim 'Peeking Point' Data – Checkpoints 1 and 2

Stopping rules from the pre-registration.

At interim 'peeking' points, data collection will be terminated if either of the below conditions are met. If neither condition is met, data collection will continue.

Both pairwise comparisons are statistically significant, with p values below the adjusted critical value ($p < .0125$ at time 1, $p < .0104$ at time 2)

The effect sizes for both pairwise comparisons are less than $d = .10$.

Table AA.1

Descriptive Statistics for Peeking Points One and Two

	Peeking Point 1			**Peeking Point 2**		
	n	*M*	*SD*	n	*M*	*SD*
No-TBI	67	3.18	1.31	99	3.23	1.26
TBI-no-education	72	3.06	1.05	100	3.16	1.21
TBI-education	71	2.66	1.03	100	2.68	1.10

<u>Peeking Point 1 Results</u>

Contrast 1: no-TBI vs TBI-education, $p = .261$ (one-tailed), $d=.11$

Contrast 2: TBI-no-education vs TBI-education, $p = .020$ (one-tailed), $d=0.39$

<u>Peeking Point 2 Results</u>

Contrast 1: no-TBI vs TBI-education, $p = .335$ (one-tailed), $d=.06$

Contrast 2: TBI-no-education vs TBI-education, $p=.003$ (one-tailed), $d= .42$

Appendix BB
Ethical Approval Letter 4905

28 May 2020

Dear Ms ELEANOR BRYANT, , , Dr CLAIRE Williams, Dr Ruth HORRY,

Re: 4905 , Traumatic brain injury in the magistrates' court: the effect of TBI education on sentencing decision making

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee.

The list of additional students (if any) are included in the table below:

Other student applicant - first name	Other student applicant - Surname	Other student applicant - email

additional researcher or student - first name	additional researcher or student - surname	additional researcher or student - email

The conditions of this approval are as follows:

1. To conduct your study strictly in accordance with the proposal that has been approved by the committee, including any approved amendments
2. To advise the ethics committee chair of any complaints or other issues that may warrant ethical review of the project
3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

Please note that failure to comply with these conditions of approval may result in the withdrawal of approval for the project.

To advertise your study on the departmental Participant Pool: You will need to send send a request for your study to be made visible, via the link on the Experiment Management System website (see Researcher Documentation for details). Please ensure that you attach this letter to your request. (If you are unable to attach the Ethics approval, send it in a separate email to Dr. Phil Tucker [redacted]

For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr IRENE Reppa (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix CC

Experiment Two: Skewness and Kurtosis Scores for Appropriateness of Sentencing Ratings

Appropriateness of Sentencing Ratings	no-TBI	TBI-no-education	TBI-education
	(n=133)	(n= 136)	(n=136)
Post-Verdict			
Skewness	-0.22	0.98	0.58
Kurtosis	2.37	2.69	1.96
Post-Ratings			
Skewness	-0.14	-0.8	0.71
Kurtosis	3.52	2.51	2.41

Appendix DD

Experiment Two– Demographic Characteristics for Participant Sub-Set

Age: 18-73 (*M* =30.11, *SD* = 11.75)

Demographic characteristics	**Sample (N=375)**	
	n	**%**
Gender		
Male	98	26.1%
Female	272	72.5%
Prefer not to say	1	0.3%
Other gender identity	4	1.1%
Ethnicity		
White	301	81.3%
Multiple ethnic groups	20	5.3%
Asian	28	7.5%
Black	11	2.9%
Latino/Hispanic	6	1.6%
Middle Eastern	1	0.3%
White Sephardic Jew	1	0.3%
African	1	0.3%
Other ethnic group	2	0.5%
Prefer not to say	4	1.1%
Educational attainment		
No formal education	2	0.5%
Secondary School	34	9.1%

Sixth form/ college	95	25.3%
First degree	152	40.5%
Master's degree	74	19.7%
PhD/ Doctorate	16	4.3%
Other	2	0.5%
Employment status		
Full time employment	135	36.0%
Part-time employment	60	16.0%
Retired	8	2.1%
Unpaid carer	5	1.3%
Not working due to disability/health reasons	5	1.3%
Actively seeking employment	21	5.6%
Volunteer	3	0.8%
Full time student	132	35.2%
Part-time student	6	1.6%
Country of residence		
Australia/ New Zealand	12	10.4%
Canada	23	6.2%
Czech Republic	1	0.3%
Croatia	1	0.3%
Finland	1	0.3%
France	3	0.8%
Germany	4	1.1%
Ireland	6	1.6%
Italy	2	0.5%

Norway	2	0.5%
Portugal	3	0.8%
Spain	1	1.3%
Sweden	3	0.8%
United Kingdom	273	72.8%
USA	29	7.7%
Other	11	3.0%

Appendix EE

Experiment 3: Interim 'Peeking Point' Data – Checkpoints 1 and 2

Stopping rules from the pre-registration.

At interim 'peeking' points, data collection will be terminated if any of the below conditions are met.

If none of these conditions are met, data collection will continue.

a) Both pairwise comparisons are statistically significant, with p values below the adjusted critical value ($p < .0125$ at time 1, $p < .0104$ at time 2)

b) The effect sizes for both pairwise comparisons are less than d = .10.

c) One contrast is futile (less than d = .10) AND the other is significant to the adjusted critical p-value ($p < .0125$ at time 1, $p < .0104$ at time 2).

.

Table EE.1

Descriptive Statistics for Peeking Points One and Two

	Peeking Point 1			**Peeking Point 2**		
	n	*M*	*SD*	n	*M*	*SD*
TBI control	118	3.03	1.19	169	2.96	1.17
TBI depersonalised	116	2.87	1.21	173	2.84	1.21
TBI personalised	119	2.75	1.14	179	2.76	1.17

<u>Peeking Point 1 Results</u>

Contrast 1: TBI control vs TBI-depersonalised AND TBI-personalised**,** $p= .053$ (one-tailed), $d=.19$

Contrast 2: TBI-de-personalised vs TBI-personalised**,** $p=.213$ (one-tailed), $d=0.10$

<u>Peeking Point 2 Results</u>

Contrast 1: TBI control vs TBI-depersonalised AND TBI-personalised, $p=.072$ (one-tailed), $d=.13$.

Contrast 2: TBI-de-personalised vs TBI-personalised, $p=.249$. (one-tailed), $d= .07$.

Appendix FF

Experiment 3: Sentencing Options Variable

Participants will be presented with one of four categories and once they have clicked their preferred sentencing option, participants will be asked to rate the severity of sentence for each option (13 options for each sentencing option)

1) A community order (range from 40 hours – 300)

Follow up length of sentencing options:

1. 40- 60 hours
2. 61- 80 hours
3. 81 – 100 hours
4. 101 - 120 hours
5. 121 - 140 hours
6. 141 -160 hours
7. 161 -180 hours
8. 181- 200 hours
9. 201- 220 hours
10. 221 – 240 hours
11. 241 – 260 hours
12. 261 – 280 hours
13. 281- 300 hours

2) A suspended custodial (prison) sentence of up to 26 weeks (the sentence will only be served if the defendant violates the conditions of the suspension during the suspended period which ranges from 6-24 months).

Follow up length of sentencing options:

1. Up to 2 weeks suspended sentence
2. 2- 4 weeks suspended sentence
3. 4- 6 weeks suspended sentence
4. 6-8 weeks suspended sentence
5. 8- 10 weeks suspended sentence
6. 10-12 weeks suspended sentence
7. 12- 14 weeks suspended sentence
8. 14-16 weeks suspended sentence
9. 16–18 weeks suspended sentence
10. 18-20 weeks suspended sentence
11. 20-22 weeks suspended sentence

12. 22-24 weeks suspended sentence
13. 24-26 weeks suspended sentence

3) A custodial (prison) sentence of up to 26 weeks

Follow up length of sentencing options:

1. Up to 2 weeks custodial sentence
2. 2- 4 weeks custodial sentence
3. 4- 6 weeks custodial sentence
4. 6-8 weeks custodial sentence
5. 8- 10 weeks custodial sentence
6. 10-12 weeks custodial sentence
7. 12- 14 weeks custodial sentence
8. 14-16 weeks custodial sentence
9. 16–18 weeks custodial sentence
10. 18-20 weeks custodial sentence
11. 20-22 weeks custodial sentence
12. 22-24 weeks custodial sentence
13. 24-26 weeks custodial sentence

4) Referral to the Crown Court for consideration beyond 26 weeks (up to 51 weeks)

Follow up length of sentencing options:

1. 26-28 weeks custodial sentence
2. 28-30 weeks custodial sentence
3. 30-32 weeks custodial sentence
4. 32-34 weeks custodial sentence
5. 34-36 weeks custodial sentence
6. 36-38 weeks custodial sentence
7. 38-40 weeks custodial sentence
8. 40-42 weeks custodial sentence
9. 42-44 weeks custodial sentence
10. 44-46 weeks custodial sentence
11. 46-48 weeks custodial sentence
12. 48-50 weeks custodial sentence
13. 50-51 weeks custodial sentence

Appendix GG
Ethical Approval Letter 5028

11 February 2021

Dear Ms ELEANOR BRYANT, , , Dr CLAIRE Williams, Dr Ruth HORRY,

Re: 5028 , 5027 - Traumatic brain injury in the magistrates' court: how do different types of information influence legal decision making?

Your application - [redacted] has been reviewed and approved by the Department of Psychology Ethics Committee.

The list of additional students (if any) are included in the table below:

Other student applicant - first name	Other student applicant - Surname	Other student applicant - email

additional researcher or student - first name	additional researcher or student - surname	additional researcher or student - email

The conditions of this approval are as follows:

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3. To submit for approval any changes to the approved protocol before implementing any such changes
4. To keep any information obtained from your participants absolutely confidential

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For students: Please ensure that the signed copy of this Ethical Approval, together with any other paperwork associated with your research, is included in your final write up.

Yours Sincerely,

Dr Menna Price (Reviewer of Application)

Dr Gabriela Jiga-Boy (Committee Chair)

Appendix HH

Experiment Three– Demographic Characteristics for Participant Sub-Set

Age: 18 -79 (*M* = 28.81, *SD* = 11.15)

Demographic characteristics	**Sample (N=654)**	
	n	**%**
Gender		
Male	156	23.9%
Female	489	74.8%
Prefer not to say	2	0.3%
Other gender identity	7	1.1%
Ethnicity		
White	469	71.7%
Multiple ethnic groups	20	3.1%
Asian	44	6.7%
Black	61	9.3%
Latino/Hispanic	3	0.5%
Middle Eastern	5	0.8%
White Sephardic Jew	1	0.2%
African	38	5.8%
Other ethnic group	9	1.4%
Other or prefer not to say	4	0.6%
Educational attainment		
No formal education	1	0.2%
Secondary School	70	10.7%

Sixth form/ college	210	32.1%
First degree	262	40.1%
Master’s degree	81	12.4%
PhD/ Doctorate	18	2.8%
Other	12	1.8%
Employment status		
Full time employment	177	27.1%
Part-time employment	104	15.%
Retired	11	1.7%
Unpaid carer	16	2.4%
Not working due to disability/health reasons	13	2.0%
Actively seeking employment	46	7.0%
Volunteer	2	0.3%
Full time student	279	42.7%
Part-time student	6	0.9%
Country of residence		
Australia/ New Zealand	29	3.%
Canada	12	1.8%
Czech Republic	2	0.3
France	4	0.7%
Germany	1	0.2%
Ireland	16	2.5%
Italy	5	0.8%
Poland	5	0.8%
Portugal	3	0.8%

Spain	5	0.8%
South Africa	99	15.2%
United Kingdom	429	65.6%
USA	19	2.9%
Other	23	4.2%